# HP Modular Cooling System
# User Guide

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## Audience assumptions

This document is for the person who installs racks and rack products. This procedure is performed only by trained personnel. HP assumes you are qualified in performing installations and trained in recognizing hazards in rack products.

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# Overview

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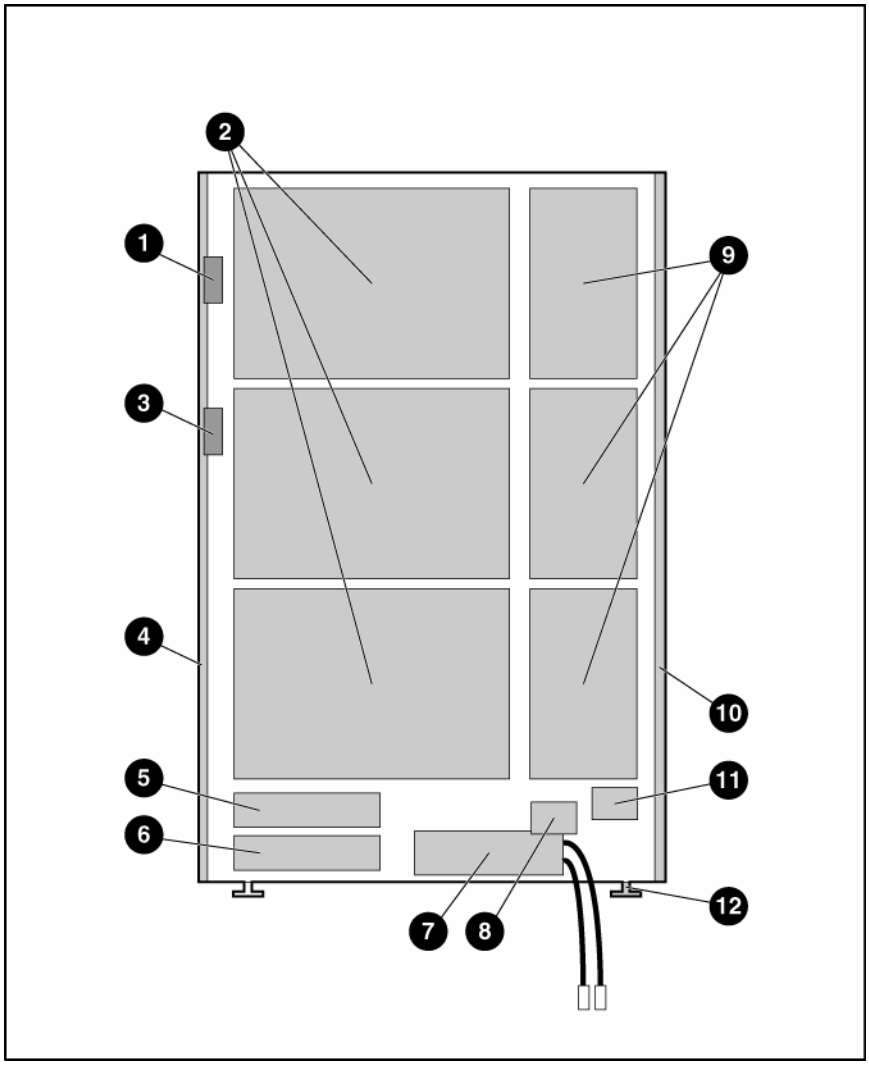
# Introduction

The HP Modular Cooling System is an air and water heat exchanger that removes high levels of excess heat generated by equipment installed in HP 10642 G2 Racks. The installed equipment takes in cold air through the front of the closed MCS unit, uses the air for internal cooling, and then expels it through the rear vents after it has been warmed. The air is then recycled through the MCS unit.




| Item | Reference |
|---|---|
| 1 | Operator display |
| 2 | Heat exchanger units |

| Item | Reference |
|---|---|
| 3 | Management module |
| 4 | Front door |
| 5 | AC transfer switch |
| 6 | Water group controller |
| 7 | Condensation pump assembly |
| 8 | Magnetic solenoid valve |
| 9 | Fan units |
| 10 | Rear door |
| 11 | Power connectors and RJ-45 connector |
| 12 | Leveling feet |

# Configuration factors

In this section

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# Optimum environment and site requirements

**CAUTION:** Contaminated water may cause decreased cooling capacity or disruption in service. It is important that the water flowing into the MCS unit meets the guidelines stated in the *HP Modular Cooling System Site Preparation Guide*. Damage caused by contaminated water is not covered by the MCS unit warranty.

**IMPORTANT:** You must read the *HP Modular Cooling System Site Preparation Guide* before beginning the installation process.

Specific environmental requirements must be met to provide optimum performance with minimum maintenance for your unit.

To help you learn about these requirements and to plan your unit configuration more efficiently, HP provides the *HP Modular Cooling System Site Preparation Guide*.

# Site preparation

The *HP Modular Cooling System Site Preparation Guide* provides specific information to help you plan your unit configuration efficiently and organize your site location prior to delivery of your MCS unit.

To locate the latest version of the *HP Modular Cooling System Site Preparation Guide*:

1. Go to the HP website (http://www.hp.com/go/rackandpower).
2. Select **Rack and Rack Options.**
3. Select **Modular Cooling System.**
4. Select **Support and Documents.**
5. Select **Manuals.**
6. Select and download the *HP Modular Cooling System Site Preparation Guide*.

# Installation

In this section

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# MCS kit contents

- HP MCS unit installed to an HP 10000 G2 Series Rack (1)
- Automatic Door Release kit (1)
- Counter hold wrench (1)
- Water hose fitting wrench (1)
- Rear plate cover (1)
- Condensation pump to facility hose (blue) (1)

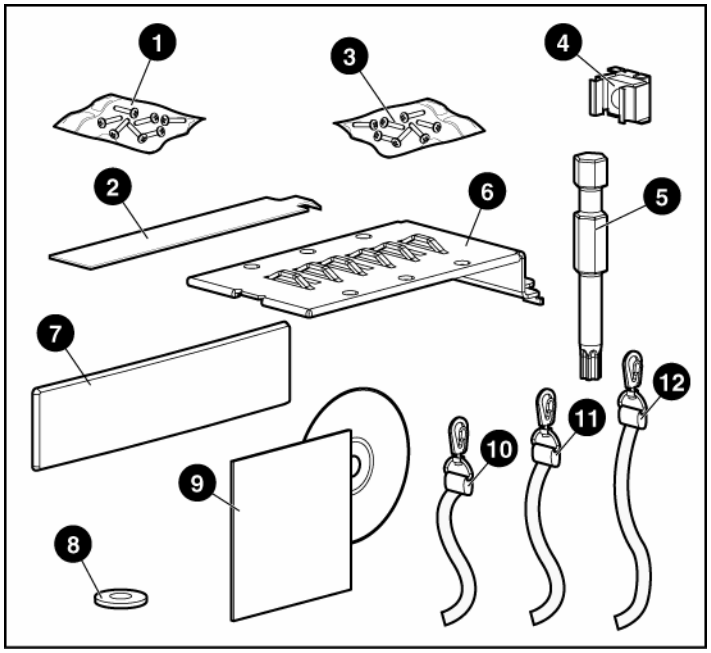
  **NOTE:** This item might come directly attached to the MCS unit rather than in the standard kit contents.

- Condensation pan to facility hose (clear) (1)
- Tubing clamp (2)
- Adjustable clamp (1)
- Power cord (3.6 m), L6-20 to C19 (2)
- Power cord (3.6 m), IEC-309 to C19 (2)
- CAT5e cable (25 ft) (1)

  **NOTE:** This item might come directly attached to the MCS unit rather than in the standard kit contents.

- Serial cable (1)

# Rack hardware kit contents




1. M6 screws (50)
2. Cage nut insertion tool (1)
3. M5.5 x 10 self tapping screws (6)
4. M6 cage nuts (50)
5. T-25 Torx bit (1)
6. Cable management bracket (6)
7. Rack ID plate (1)
8. Leveling foot base (6)
9. Documentation CD (1)
10. Hook-and-loop cabling strap 12.7-cm (5 in) clip (1)
11. Hook-and-loop cabling strap 20.3-cm (8 in) clip (1)
12. Hook-and-loop cabling strap 30.5-cm (12 in) clip (1)

# Required tools

The following tools are required for installation:

- Flathead screwdriver
- #2 Phillips screwdriver
- Adjustable wrench
- T-25 Torx driver
- T-30 Torx driver
- Water hose fitting wrench (included with your MCS kit contents)

- Counter hold wrench (included with your MCS kit contents)
- Bubble level

# Installing the MCS unit

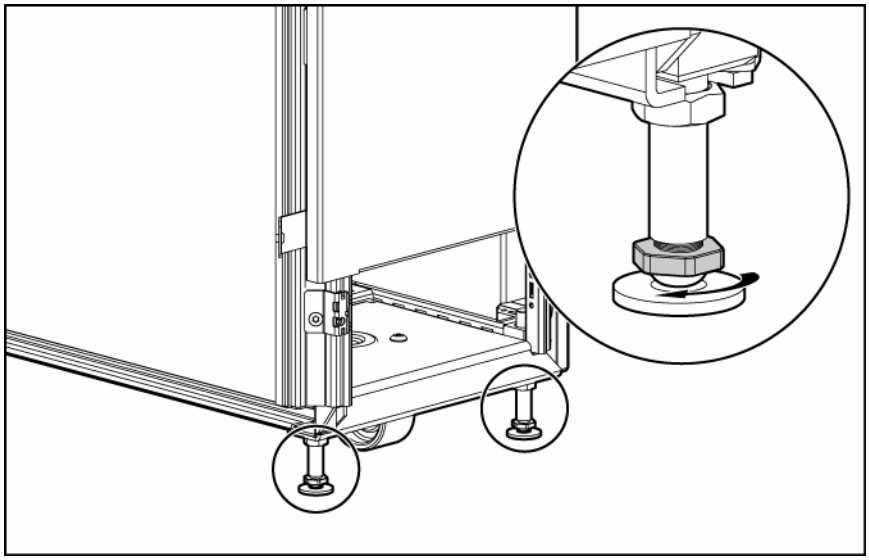
**WARNING:** The MCS unit and rack are shipped together on a heavy duty shock pallet weighing approximately 2000 lb. HP recommends hiring professional movers to move the heavy duty shock pallet, and then remove the MCS unit and rack from the pallet and into to the final location.

**CAUTION:** Contaminated water may cause decreased cooling capacity or disruption in service. It is important that the water flowing into the MCS unit meets the guidelines stated in the *HP Modular Cooling System Site Preparation Guide*. Damage caused by contaminated water is not covered by the MCS unit warranty.

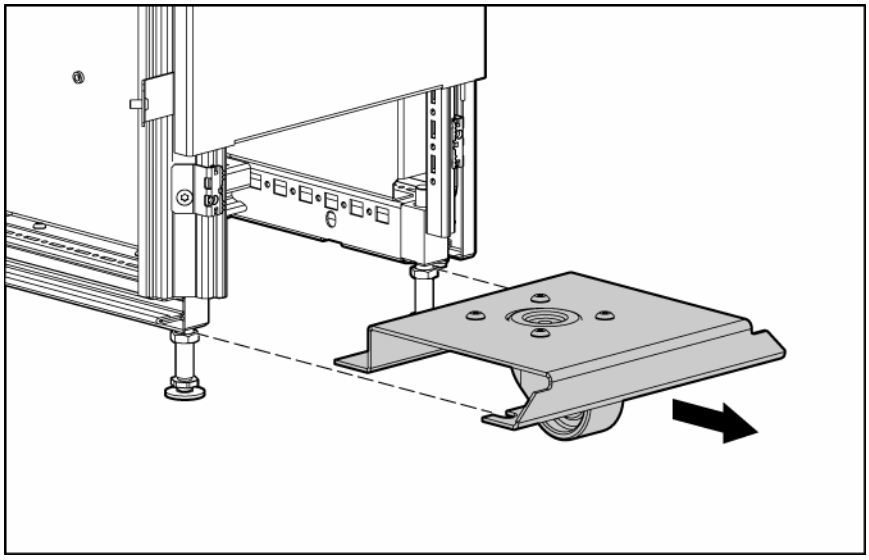
**IMPORTANT:** You must read the *HP Modular Cooling System Site Preparation Guide* before beginning the installation process.

**IMPORTANT:** Be sure to install the HP Water Hook-up Option Kit before connecting the In and Out water hoses to the water lines.

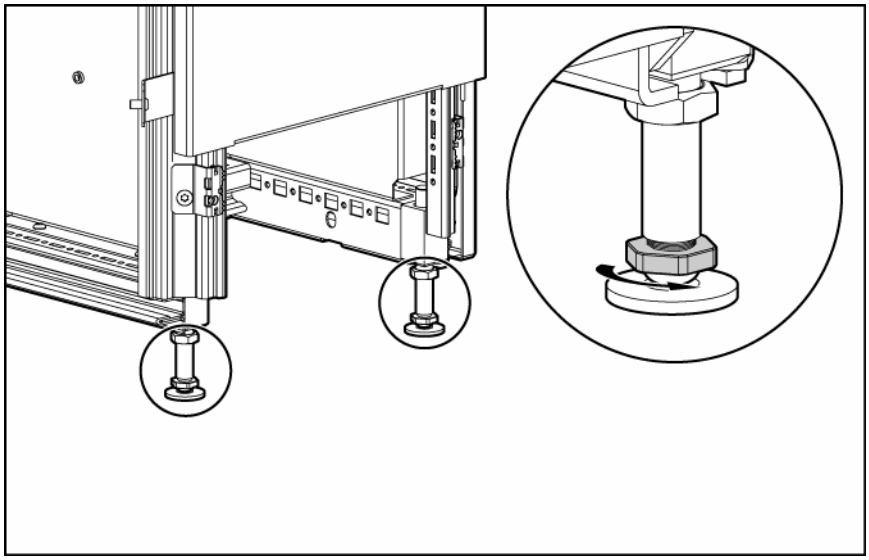
1. Read the unpacking instructions on the MCS packaging material.
2. With four or more people, carefully remove the MCS unit and rack from the pallet.
3. Roll the MCS unit and rack approximately 91 cm (3 ft) in front of the final location.
4. Loosen the jam nut, and raise the unit by lowering the two rear leveling feet on both the MCS unit and the rack until the rear caster plate can be removed.



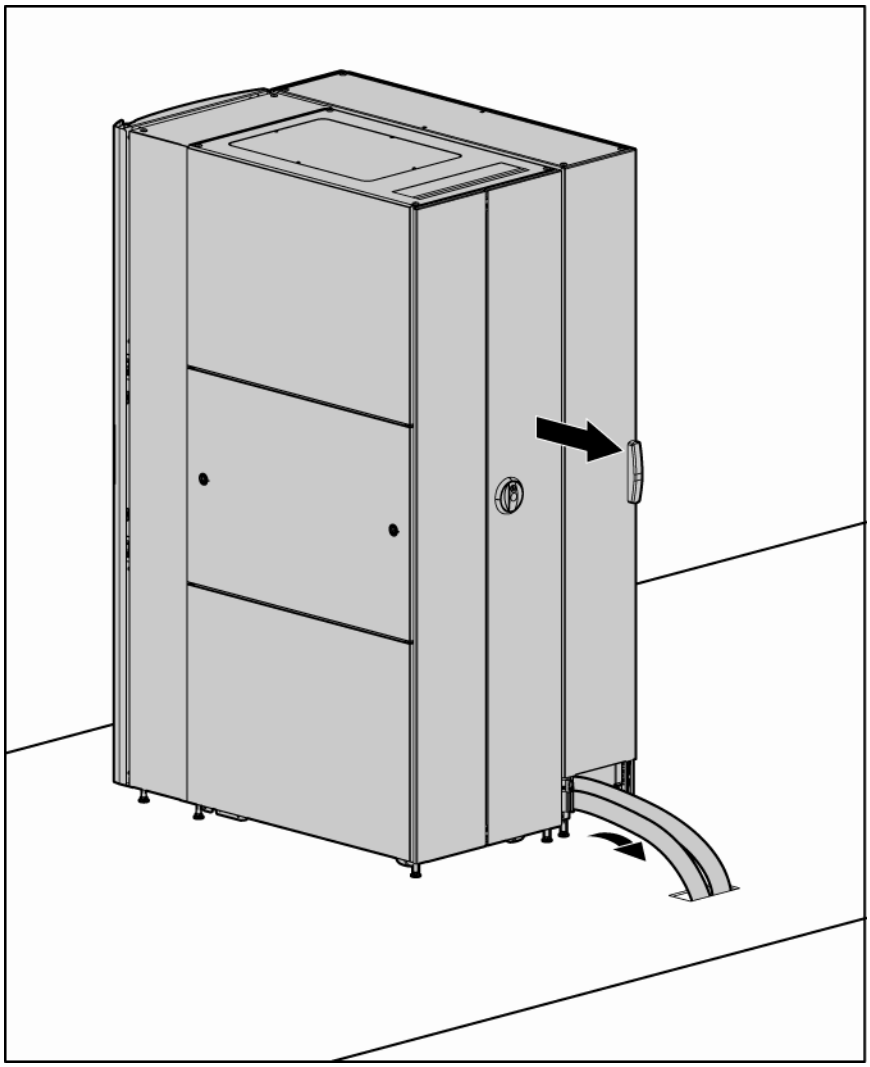
5. Remove the rear caster plate.



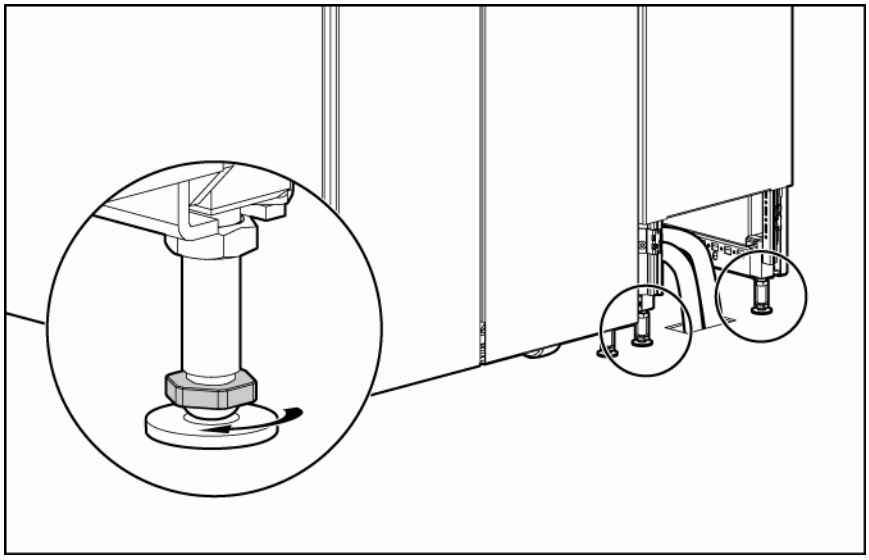
6. Lower the unit by raising the two rear leveling feet on both the MCS unit and the rack so that the MCS unit can move freely on the remaining casters.



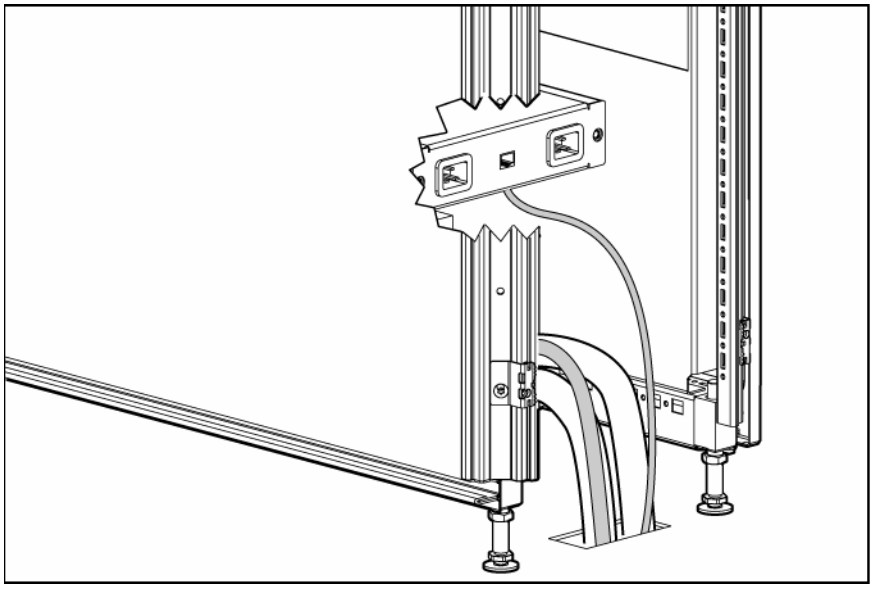
7. Roll the MCS unit and rack into the final location while guiding the In and Out water hoses through the raised floor opening.



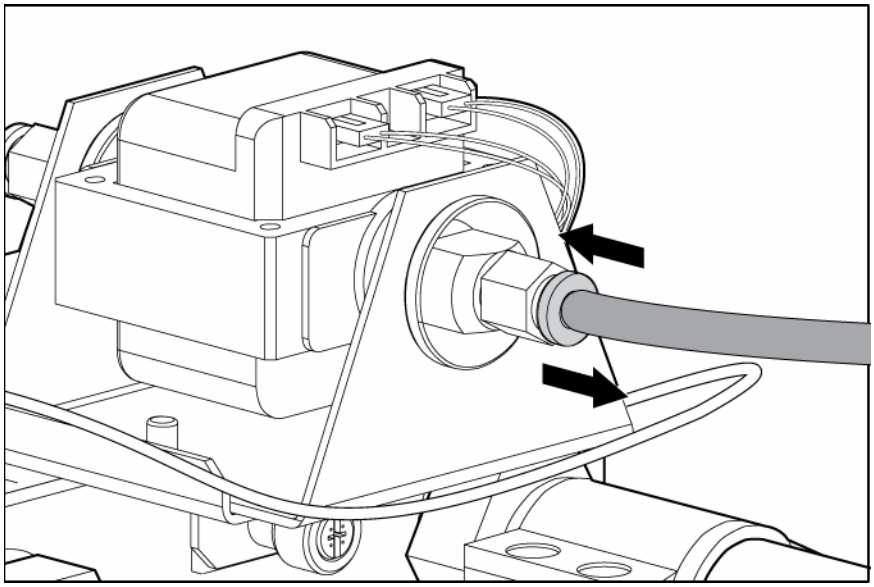
8. Using a bubble level, adjust the leveling feet to level the MCS unit and rack.



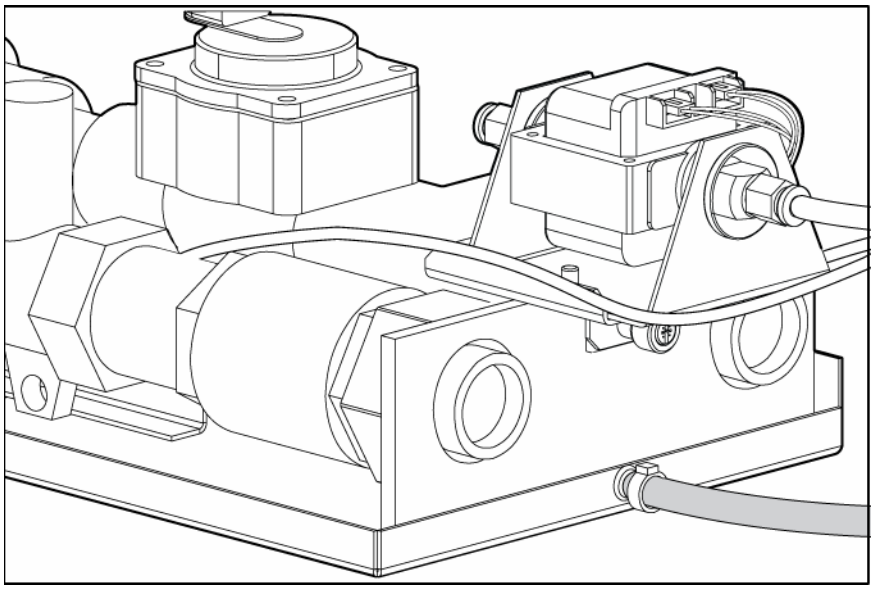
9. Install and route the two drain hoses to the drain collection system catch basin.



a. Install the blue drain hose by inserting one end of the hose into the plastic collar quick connect on the condensation pump, and then route the other end into either the condensation return line or the gravity drain collection system catch basin.

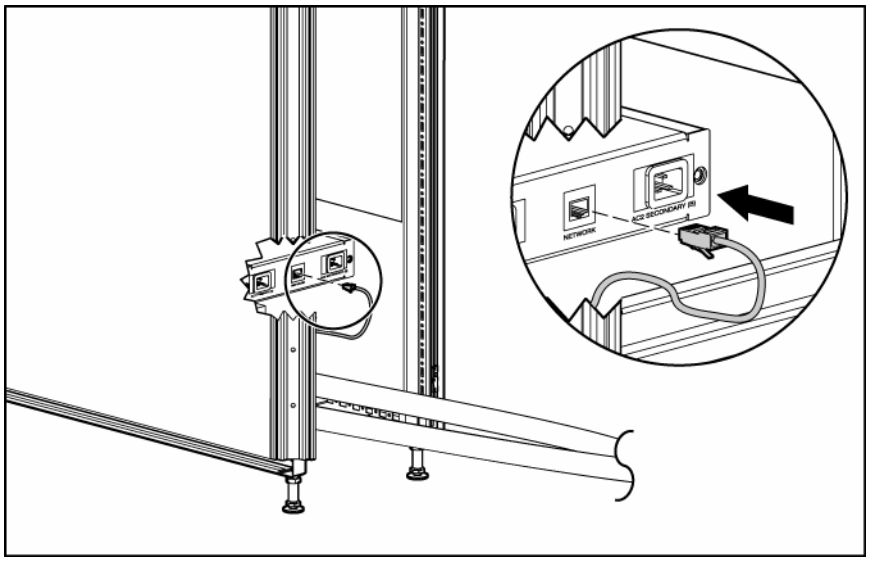


b. Install the clear drain hose by inserting one end of the hose into the condensation collection pan, and then route the other end into the gravity drain collection system catch basin.



**NOTE:** Position the gravity drain collection system below the condensation collection pan, allowing gravity to draw the water out of the condensation collection pan and into the gravity drain collection system catch basin.

10. Plug the network cable into the RJ-45 connector located above the In and Out water hoses.



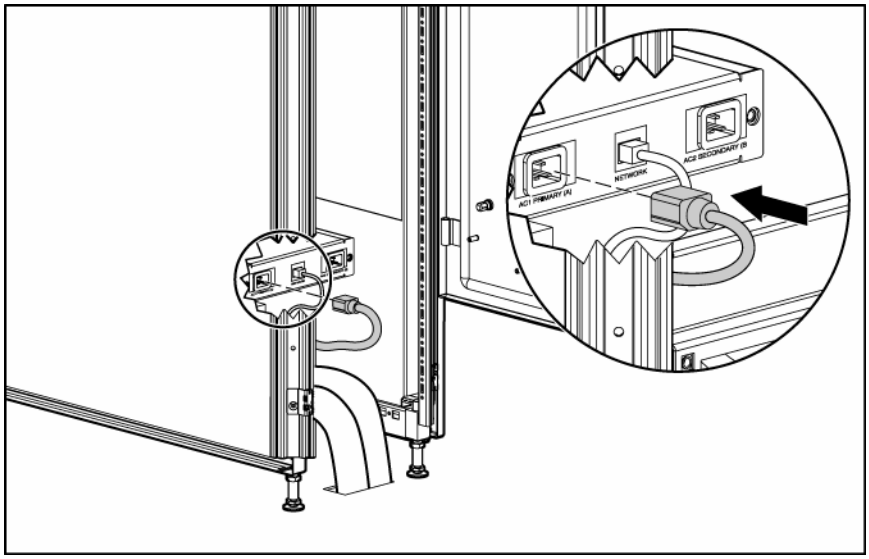
11. Guide the other end of the network cable through the bottom of the MCS unit.

**IMPORTANT:** Do not connect the power cords into a power supply.

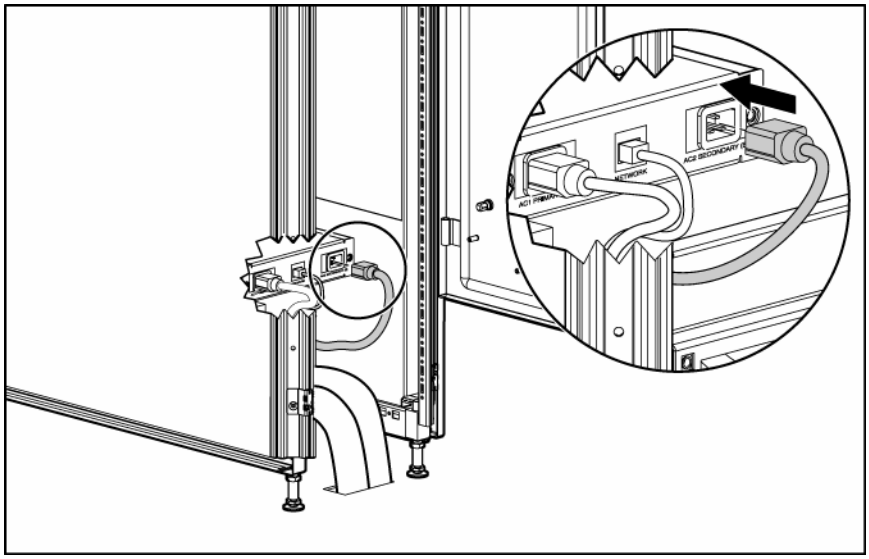
12. Plug the primary power cord into the power connector on the left.

**WARNING:** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the storage system.



13. If a secondary power cord is being used, plug it into the power connector on the right.

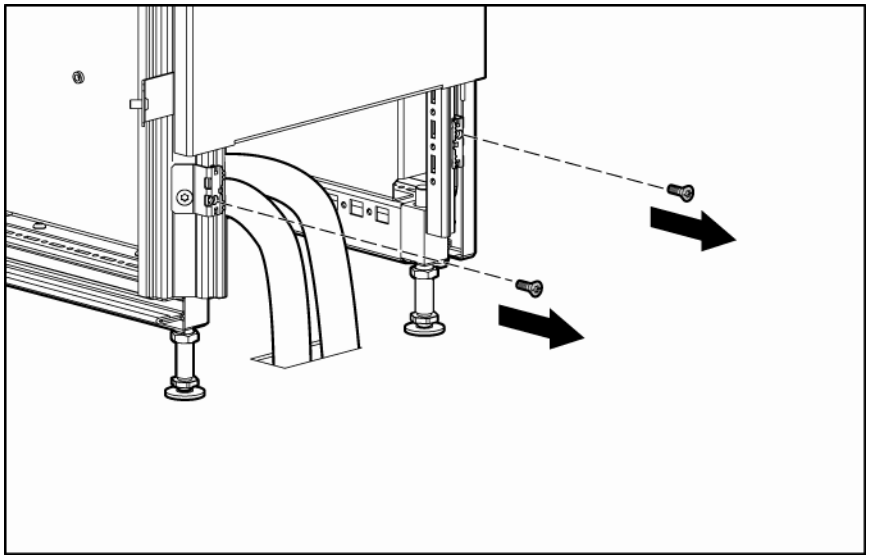


14. Guide the other end of the power cords through the bottom of the MCS unit.

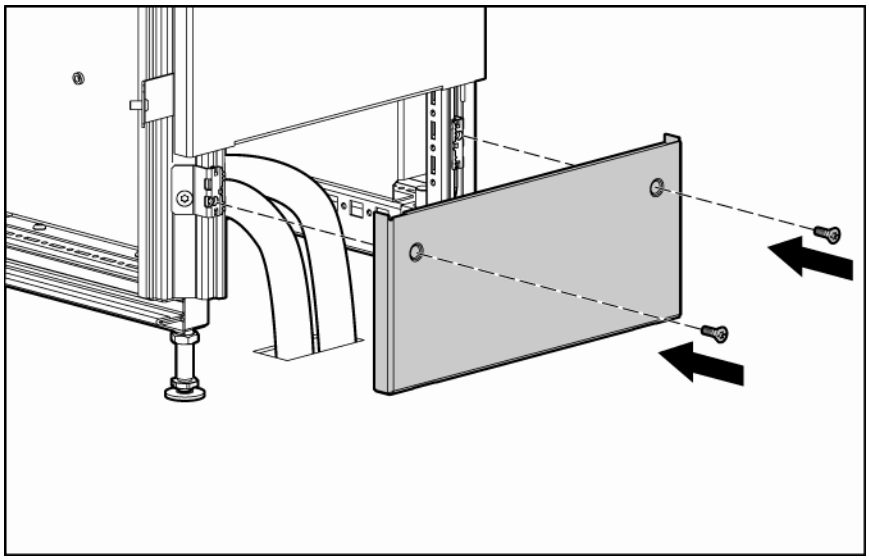
**IMPORTANT:** Be sure to flush the prearranged facility water lines of debris prior to connecting them to the In and Out hoses.

15. Connect the In and Out water hoses to the prearranged facility water lines.

16. Turn on the water to the prearranged facility water lines.
17. (Optional) Remove the two screws from the bottom brackets on the MCS frame.



18. (Optional) Align the access panel with the two holes from step 17.
19. (Optional) Secure the access panel to the MCS frame using the two screws you removed in step 17.



# Powering up and configuring the unit

⚠ **WARNING:** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply to disconnect power to the equipment.
- Do not route the power cord where it can be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord extends from the storage system.

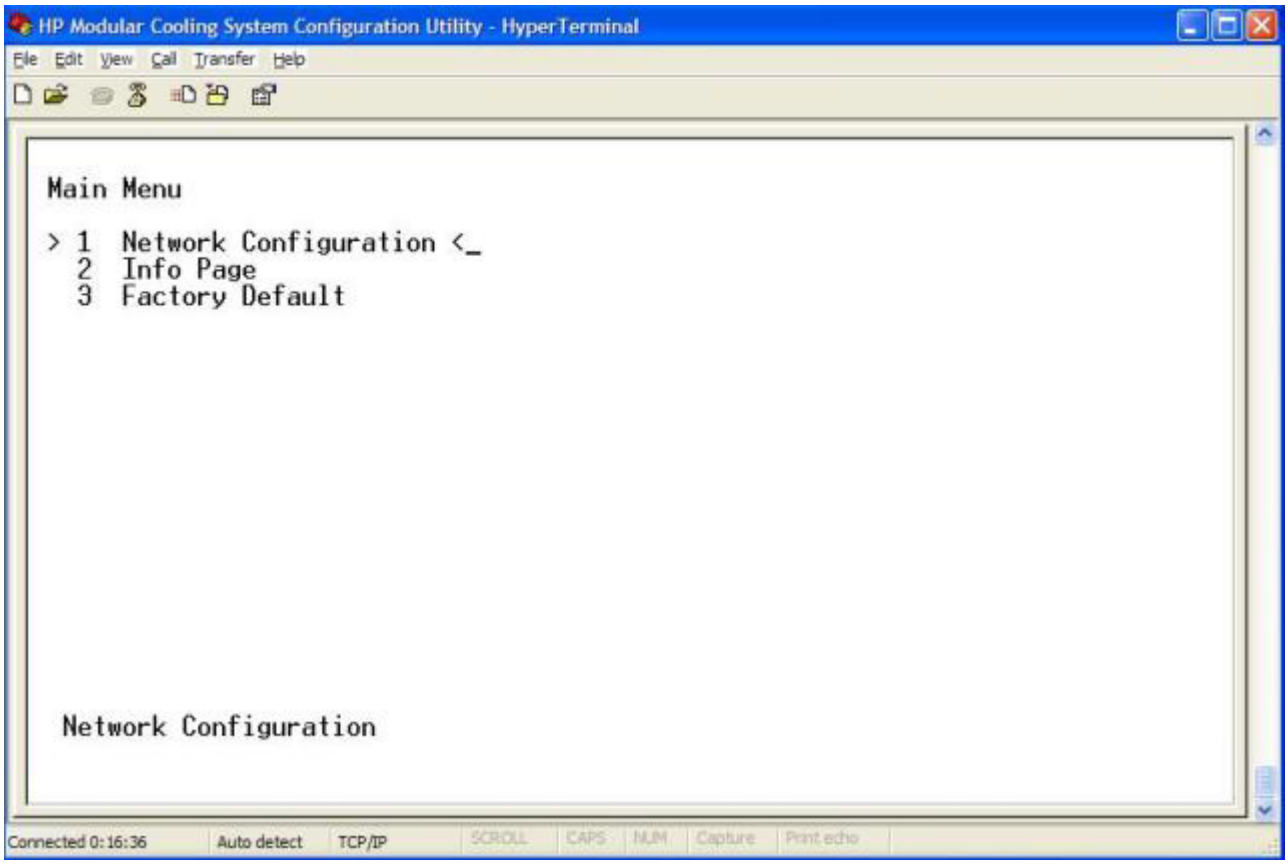
The following steps outline the sequence for powering up and configuring the unit.

1. Plug the power cord into an appropriate power source.
2. Connect the network cable to your network infrastructure.

   **NOTE:** If you have a DHCP server, you can change the IP address through the web interface instead of through the serial port. For more information, refer to "Configuring the IP address through the web interface."

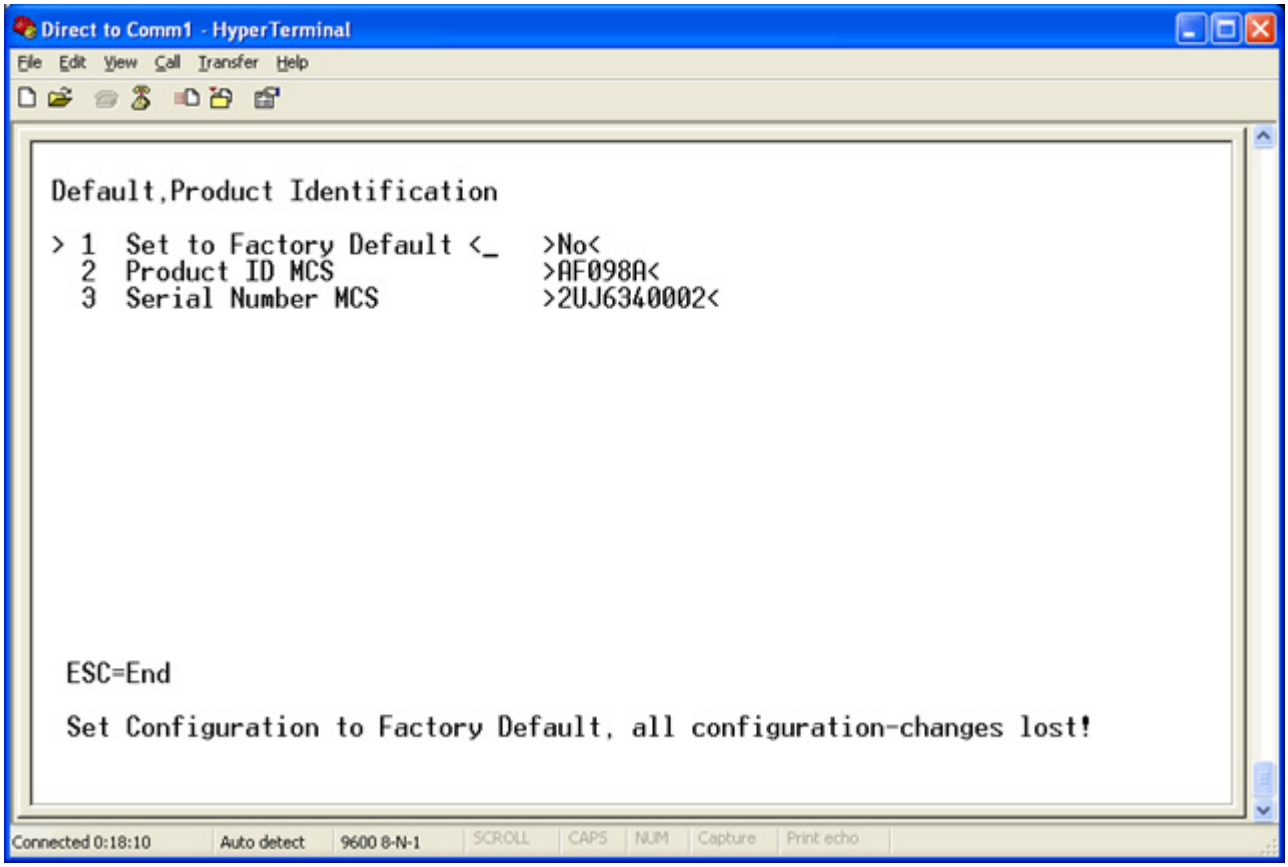
3. Connect a PC with a serial port or an asynchronous terminal to the serial communication port on the management module (using the serial cable provided).
4. Access the management module through a terminal emulation program, such as HyperTerminal ("Configuring HyperTerminal" on page 43) or Minicom.
5. Log in to the HP Modular Cooling System Configuration Utility.
   a. Enter the user name in the login field. The default user name is Admin.

b. Enter the password in the password field. The default password is Admin. The Main Menu screen appears.




6. Enter the product ID and serial number. The product ID and 10-digit serial number are located on a label inside the rear MCS unit door.

a. From the Main Menu screen, enter `3 Factory Default`. The Default Product Identification screen appears.




**NOTE:** MCS units with part number 405930-001 that have been upgraded from the Management Controller version 1.0 may not have the product ID or serial number on the unit. In such cases, use `AF098A` as the product ID.

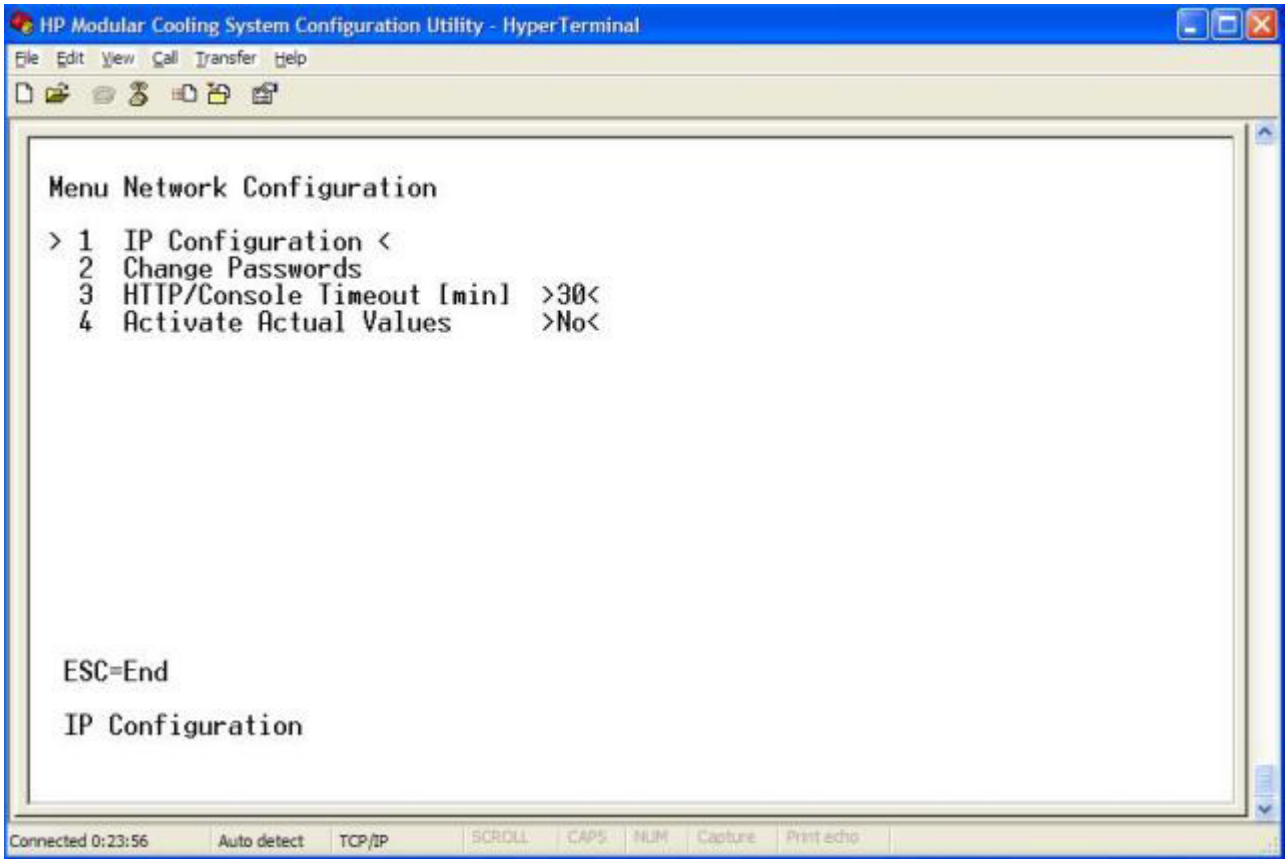
b. Enter `2 Product ID MCS` to set the product ID.

c. Enter `3 Serial Number MCS` to set the serial number.

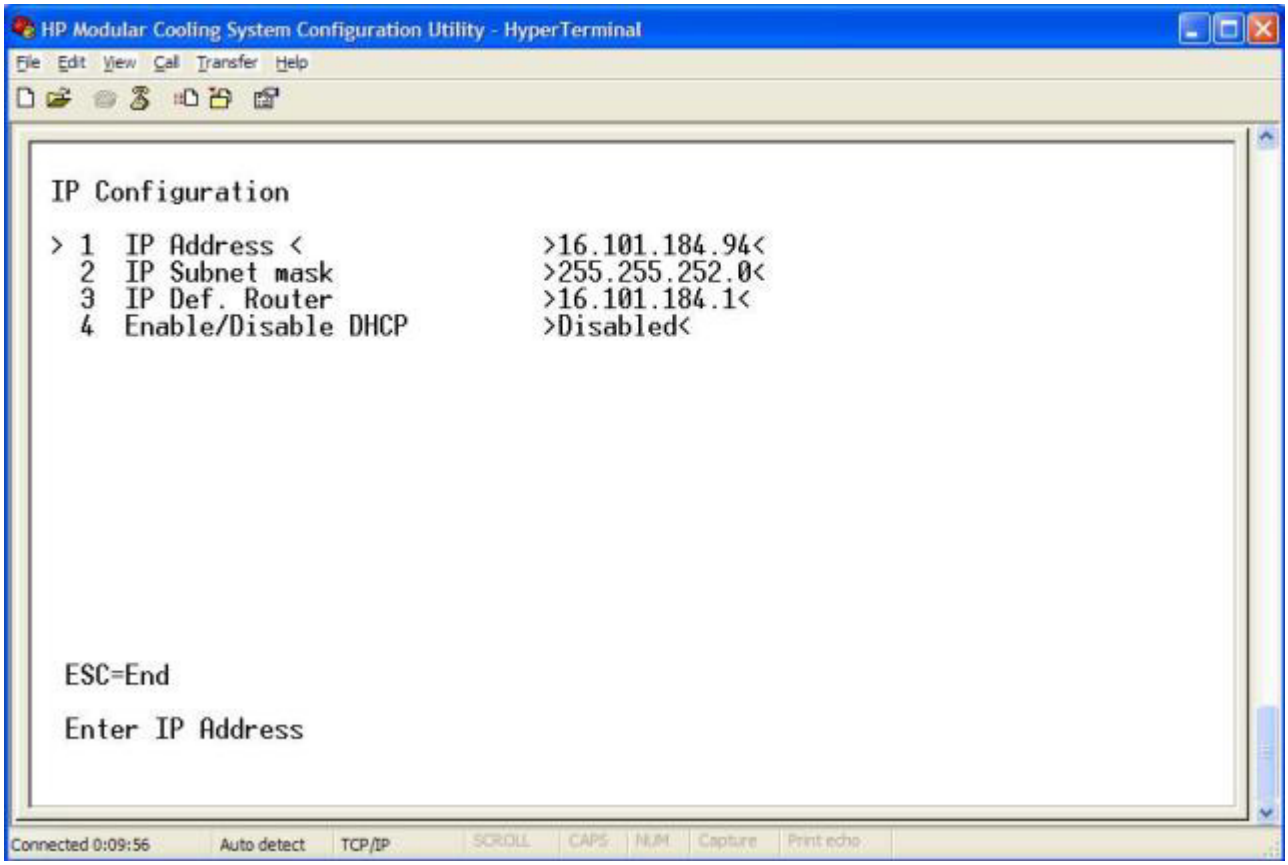
d. Press **Esc** to return to the Main Menu screen.

7. Access the HP Modular Cooling System Configuration Utility.

a. From the Main Menu screen, enter `1 Network Configuration`. The Menu Network Configuration screen appears.



b. Enter `1 IP Configuration`. The IP Configuration screen appears.




c. Enter `4 Enable/Disable DHCP` to disable DHCP.

d. Enter `1 IP Address`, and then enter the new IP address.

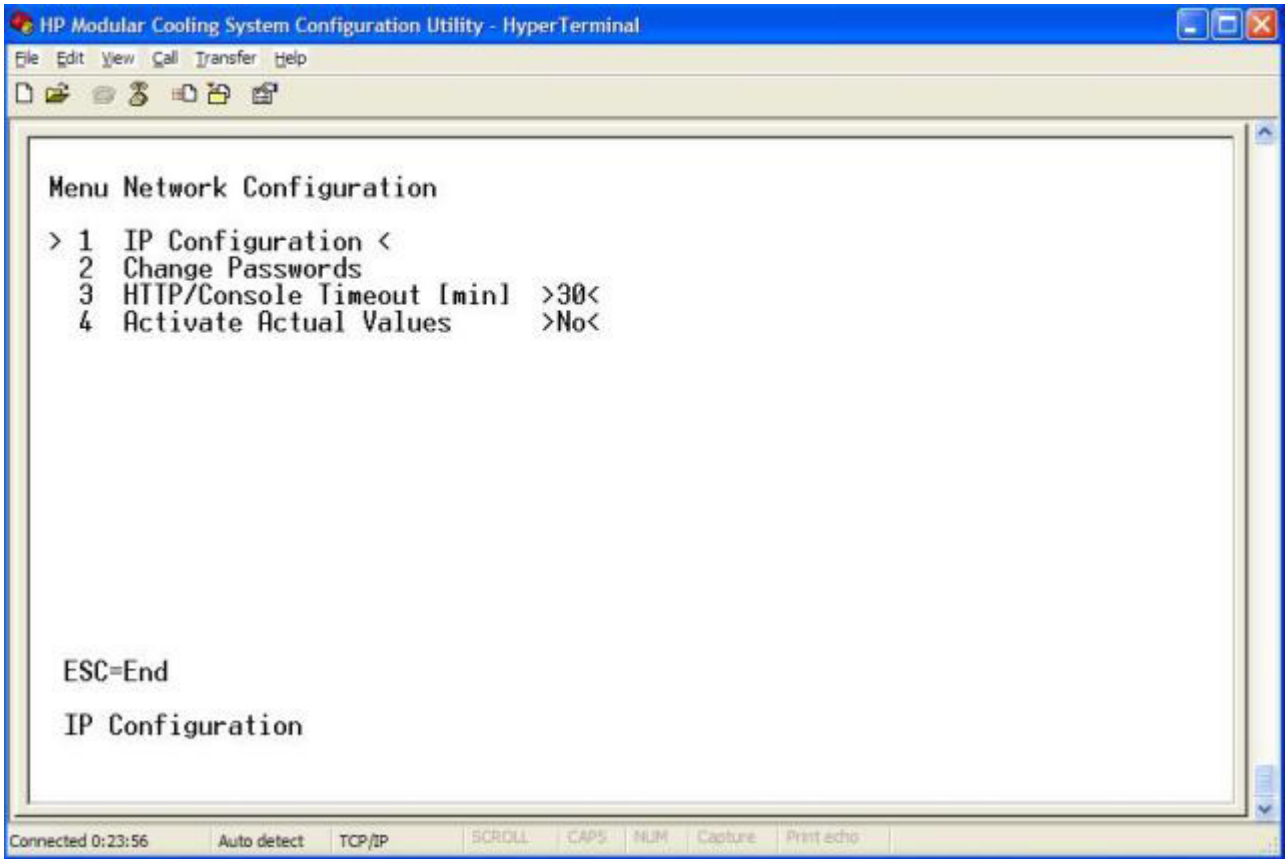
e. Enter `2 IP Subnet mask`, and then enter the IP subnet mask.

f. Enter `3 IP Def. Router`, and then enter the gateway.

**NOTE:** MCS units with part number 405930-001 that have been upgraded from the Management Controller version 1.0 may not have the product ID or serial number on the unit. In such cases, use `AF098A` as the product ID.

8. Activate the values.

a. Return to the Main Menu Network Configuration screen.




b. Enter `4 Activate Actual Values`.

c. Enter `y` at the prompt to reboot. You must reboot for the IP settings, product ID, and serial number values to be activated.

9. Access the Management module through the web interface.

a. Launch a supported browser. The browser window appears.

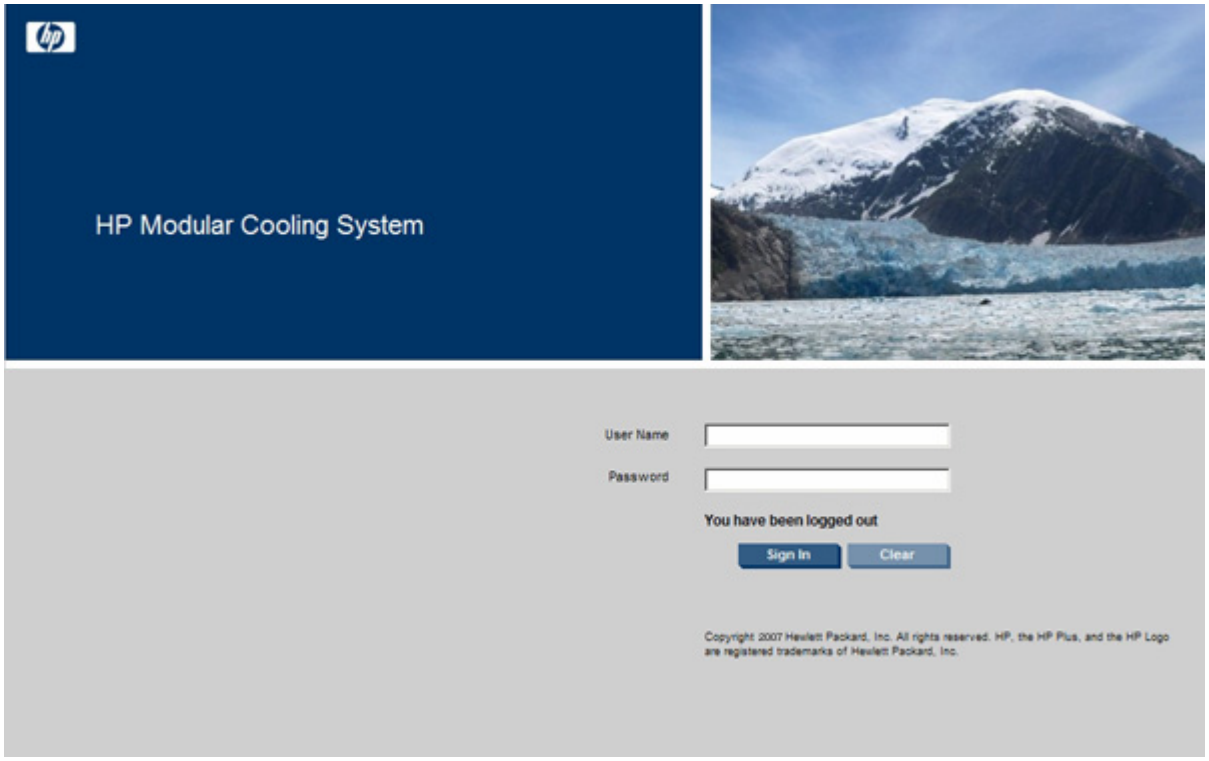
b. In the Address field (Microsoft® Internet Explorer) or the Location field (Mozilla), enter `http://ipaddress` (where `ipaddress` is the IP address of the management module). The login screen appears.

10. Log in through the web interface.

a. Enter the user name in the User Name field. The default user name is `Admin`.

b. Enter the password in the Password field. The default password is `Admin`.

c. Click **Sign In.**


HP Modular Cooling System
User Name
Password
You have been logged out
Sign In
Clear
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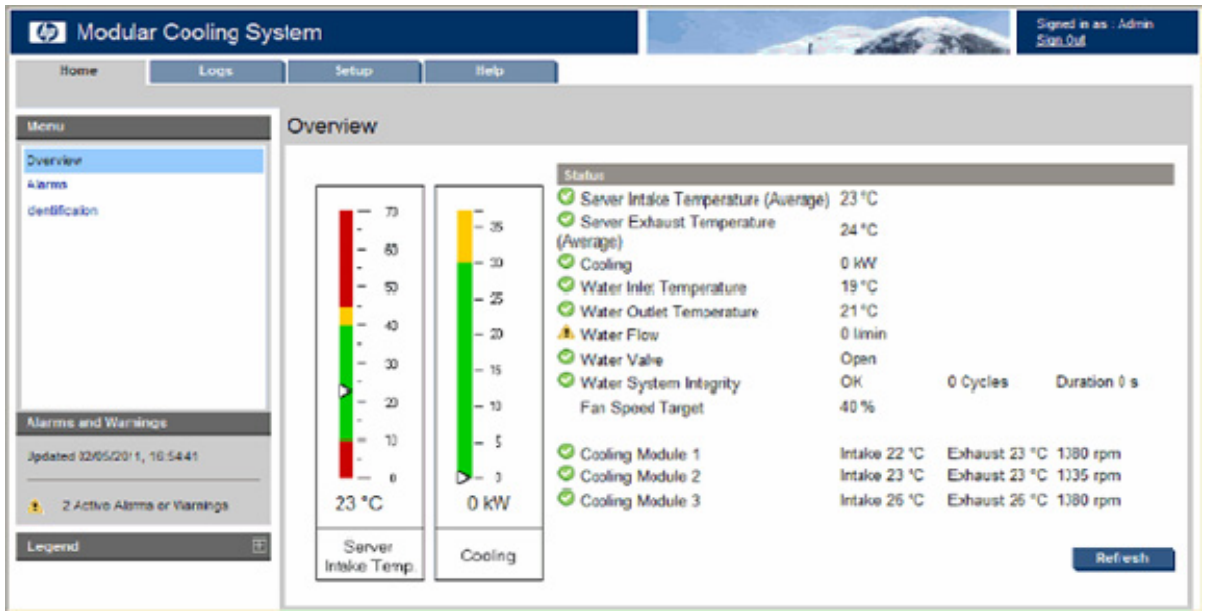
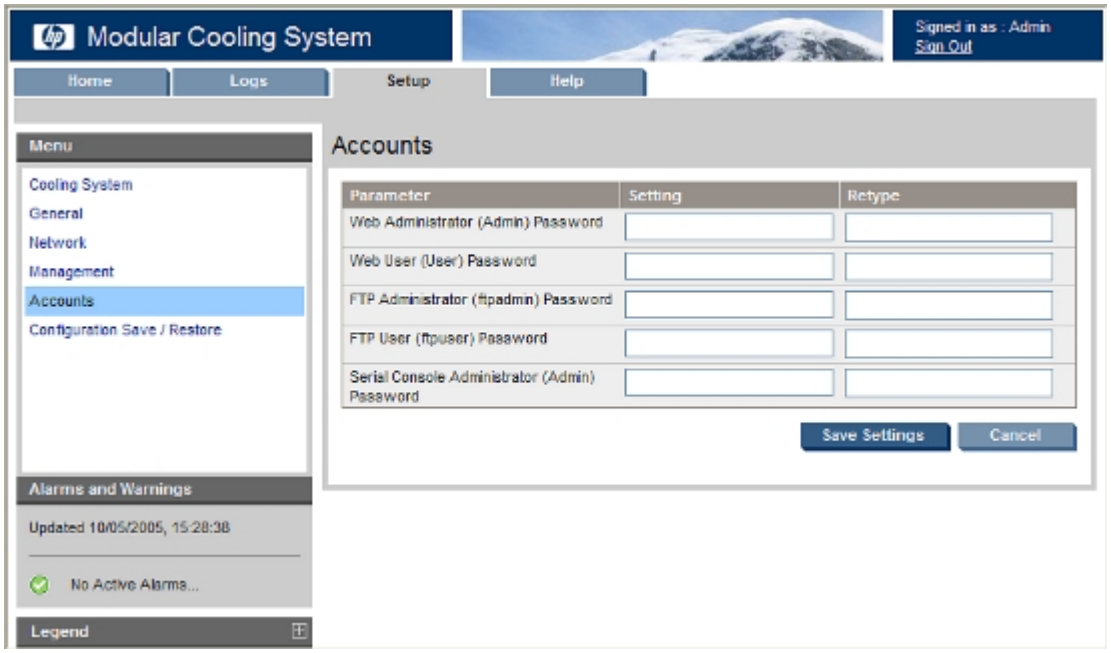
11. Verify that the water source is available and turned on by viewing the Water Flow status in the Overview menu. Be sure that you do not have a water flow warning as shown in the following figure.

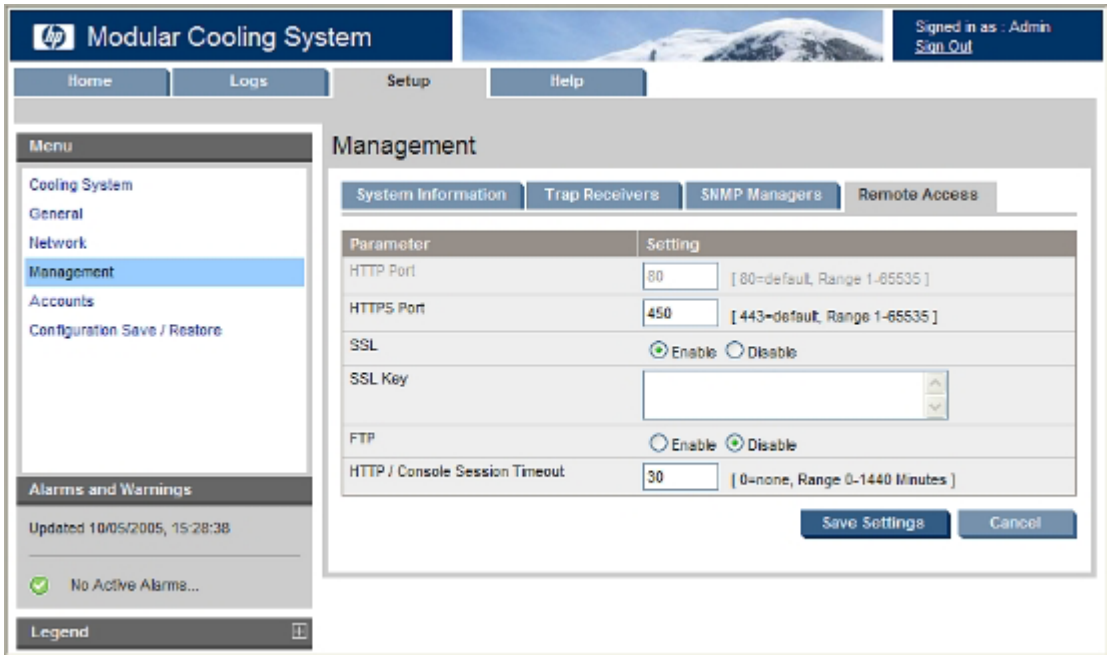


12. Click **Setup>Accounts,** and then change the Web Admin and Web User passwords.



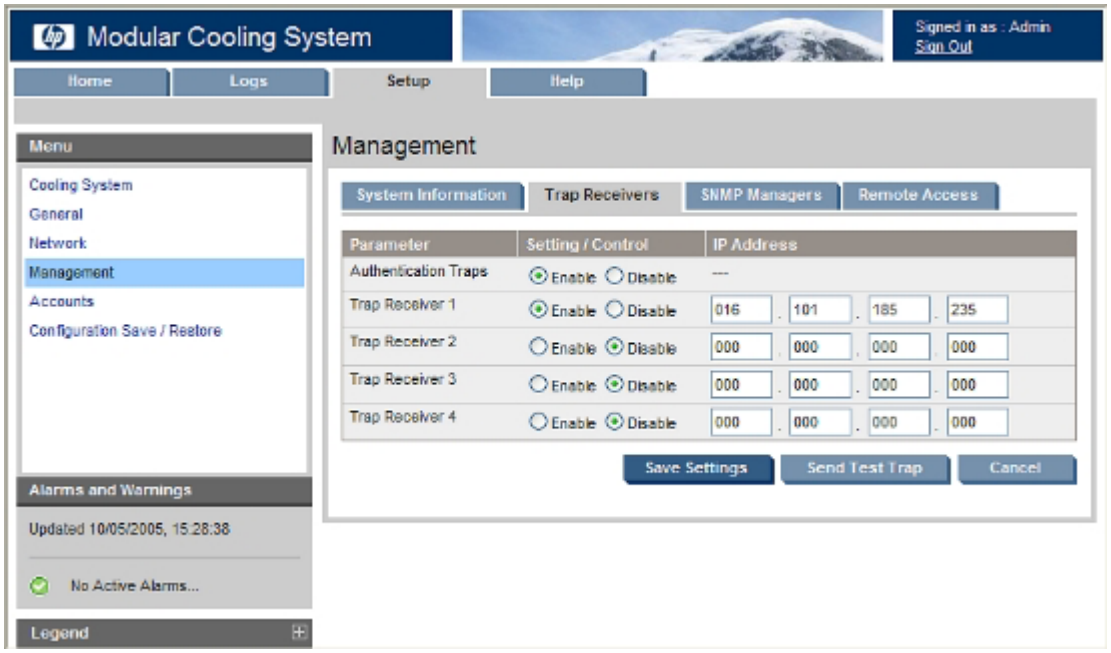

13. Click **Save Settings.**

14. (Optional, but recommended) Click **Setup>Management>Remote Access,** then select the **SSL Enable** radio button and optionally enter an SSL key.



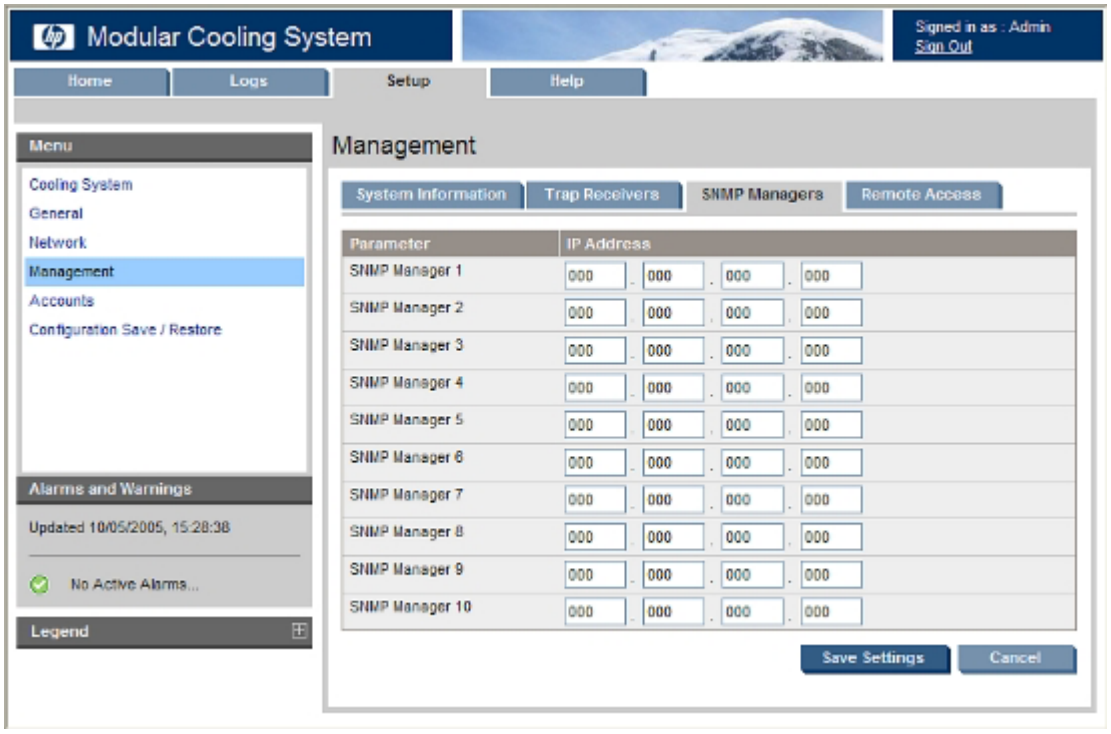

15. Click **Save Settings.**

16. Click **Setup>Management>Trap Receivers** to set up your trap receivers.




17. Click **Save Settings.**

18. (Optional but recommended) Click **Setup>Management>SNMP Managers** to set up your SNMP managers.

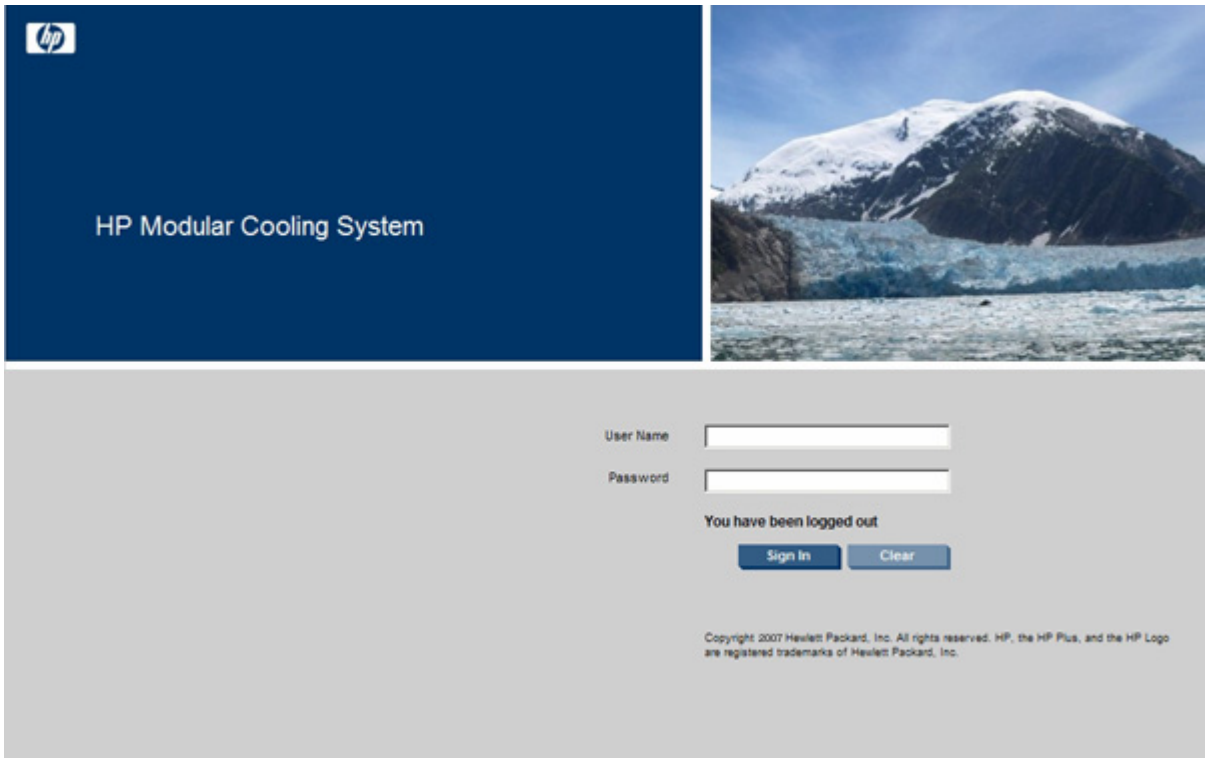



19. Click **Save Settings.**

# Configuring the IP address through the web interface

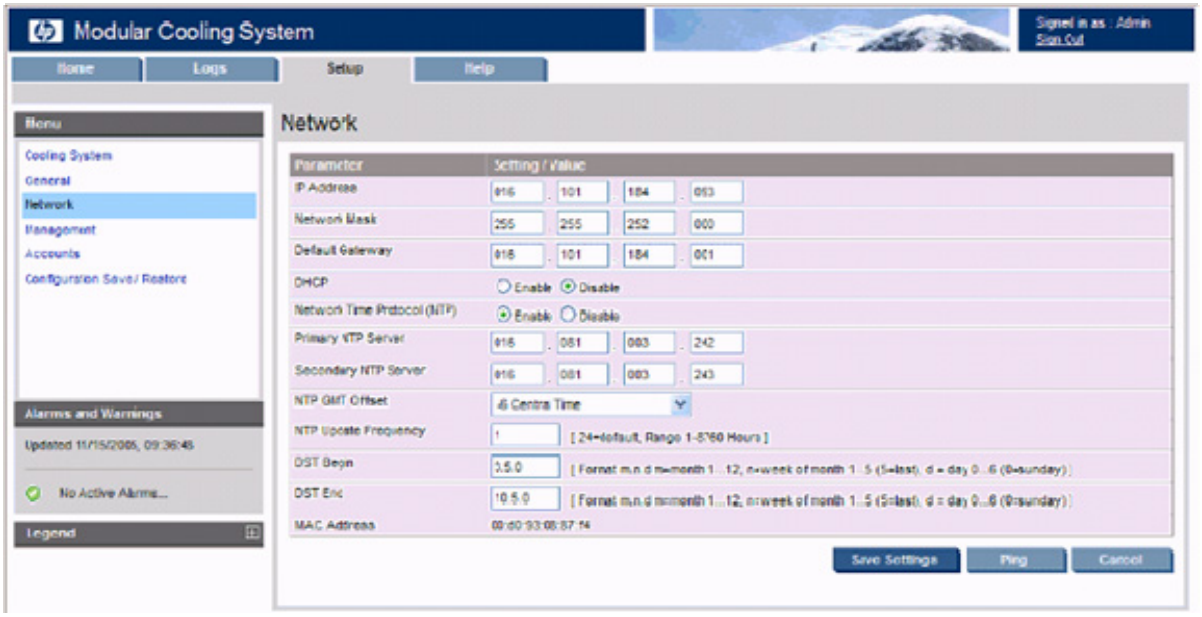
1. View the IP address received from DHCP on the operator display.

2. Access the Management module through the web interface.
   a. Launch a supported browser. The browser window appears.
   b. In the Address field (Internet Explorer) or the Location field (Mozilla), enter `http://ipaddress` (where `ipaddress` is the IP address of the management module). The login screen appears.
3. Log in through the web interface.
   a. Enter the user name in the User Name field. The default user name is `Admin`.
   b. Enter the password in the Password field. The default password is `Admin`.
   c. Click **Sign In.**

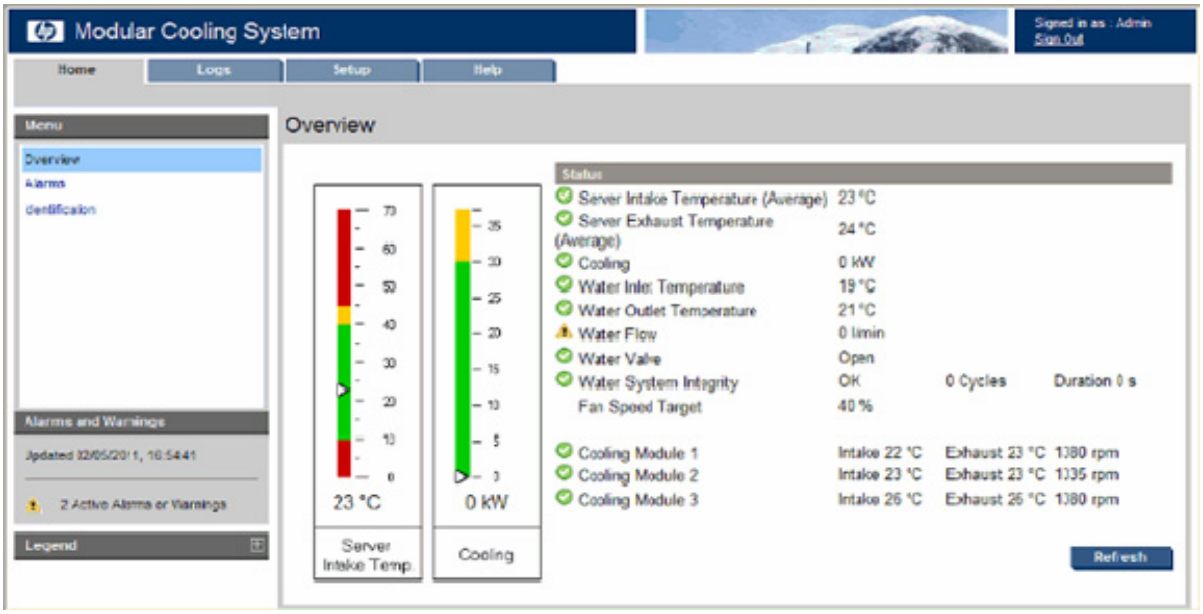

HP Modular Cooling System
User Name
Password
You have been logged out
Sign In
Clear
Copyright 2007 Hewlett Packard, Inc. All rights reserved. HP, the HP Plus, and the HP Logo are registered trademarks of Hewlett Packard, Inc.

4. Click **Setup>Network.**
   a. Select to disable DHCP (enabled is the default setting) from the DHCP radio buttons.
   b. Click **Save Settings.**
   c. Change the IP address in the IP Address field of the management module.
   d. Change the network mask of the management module.
   e. Change the default gateway of the management module.
   f. Click **Save Settings.**

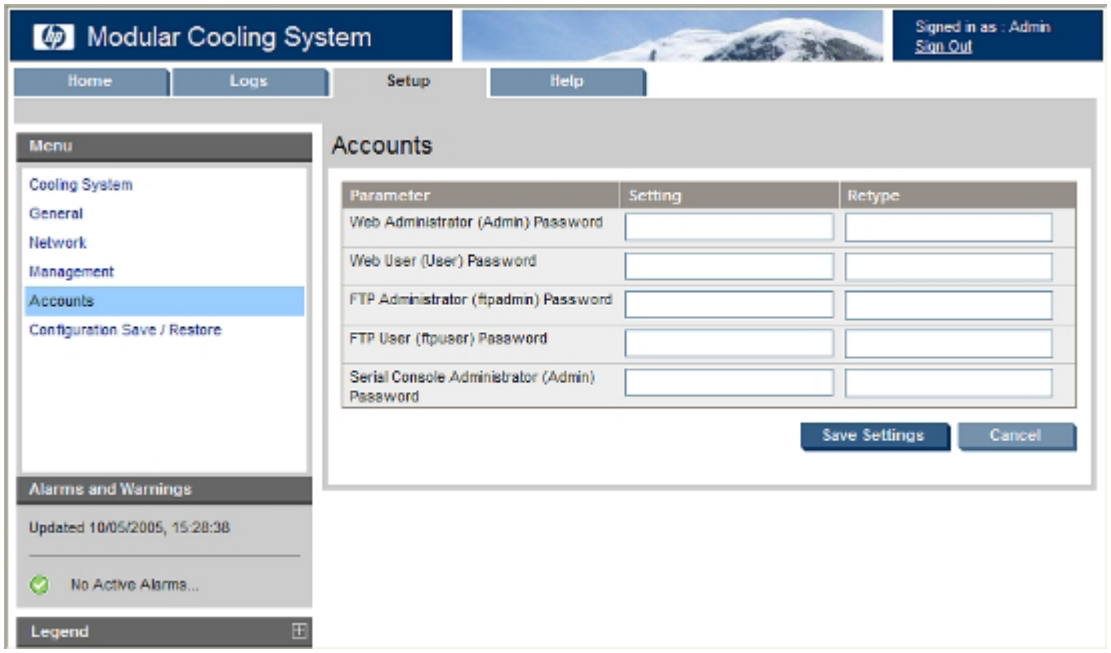
g. Log in to the new IP address.




5. Verify that the water source is available and turned on by viewing the Water Flow status in the Overview menu. Be sure that you do not have a water flow warning as shown in the following figure.

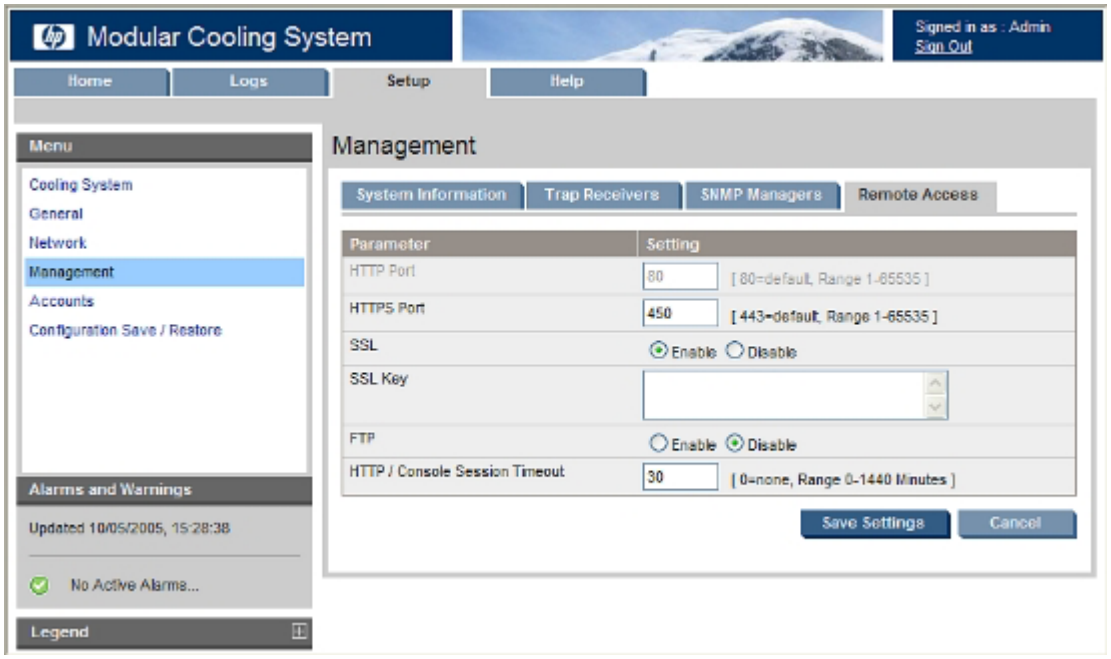


6. Click **Setup>Accounts,** and then change the Web Admin and Web User passwords.



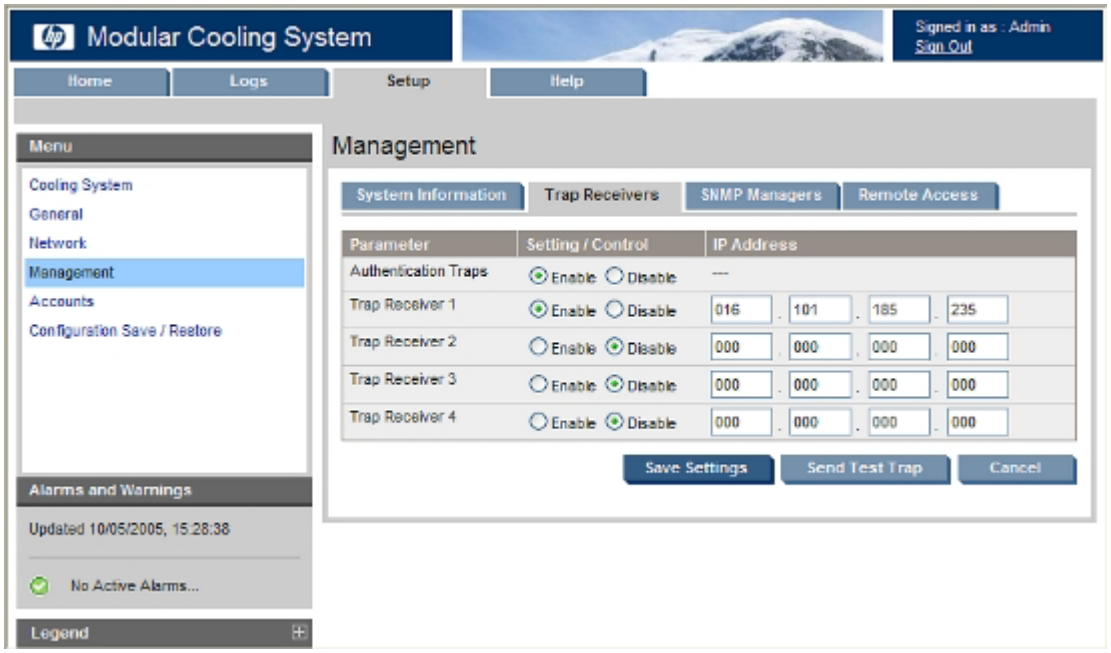

7. Click **Save Settings.**

8. (Optional, but recommended) Click **Setup>Management>Remote Access,** then select the **SSL Enable** radio button and optionally enter an SSL key.



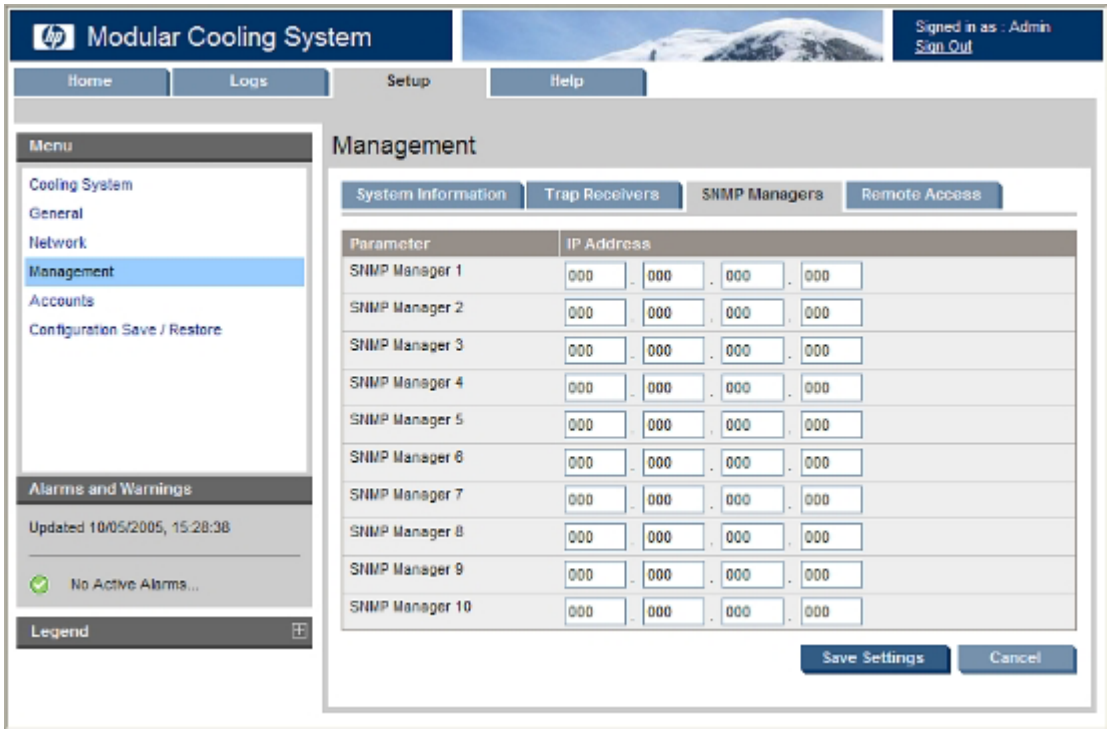

9. Click **Save Settings.**

10. Click **Setup>Management>Trap Receivers** to set up your trap receivers.




11. Click **Save Settings.**

12. (Optional, but recommended) Click **Setup>Management>SNMP Managers** to set up your SNMP managers.




13. Click **Save Settings.**

# Management module

In this section

Management module overview ..... 30
Management module components ..... 31
Accessing the management module through a terminal emulation program ..... 32
Accessing the management module through the web interface ..... 33
Connecting an external alarm relay ..... 35

# Management module overview

The HP Modular Cooling System has a management module which can be accessed remotely through the web interface, that analyzes, queries, and manages various measurements, and warning and alarm messages from the unit.

The management module analyzes measurements provided by each sensor or module, generates any necessary warning or alarm messages, and then sends them to the web interface. When a new warning or alarm occurs, the warning and alarm messages (on page 45) appear on the operator display, as well as on the web interface Alarms menu and Alarm History menu. An alarm relay is also activated (if installed on the unit and enabled in the appropriate web interface menu), and an alarm is signaled acoustically by the internal beeper (if enabled in the appropriate web interface menu).

The management module performs regulation operations, such as:

- Retrieving all measurements from the fan units and the water units in cycles, about once per second (temperature, fan speed, and chilled water flow rate)
- Analyzing all measurements and generated alarm and warning messages
- Calculating heat removed from the water flow rate and temperature of the water supply and return
- Measuring water flow rate
- Regulating the server air inlet temperature by controlling the water flow
- Sending control settings for fan speeds back to the HP Modular Cooling System
- Sending various system values to the web interface

The web interface displays various measurements and warning and alarm messages (on page 45) from the management module. Also, various system values can be set through the web interface and sent to the management module. For more information about the web interface, see the *HP Modular Cooling System Web Interface User Guide*.

The following values can be set through the web interface and sent to the management module:

- Server Intake Temperature Set Point—Target value used by the management module for server intake regulation
- Hysteresis Value—Value used by the management module for air temperature regulation
- High Temperature Threshold—Temperature difference above Server Intake Temperature Set Point for temperature-critical alarm message

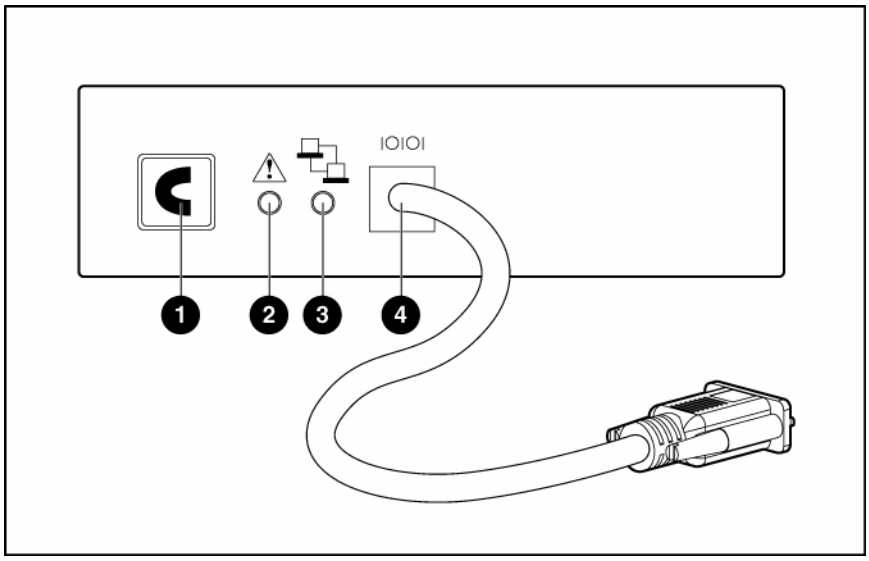
- Warning Temperature Threshold—Temperature difference above Server Intake Temperature Set Point for temperature warning message
- Low Temperature Threshold—Temperature difference below Server Intake Temperature Set Point for temperature warning message

The following values are displayed in the web interface for information only:

- Fan Speed Target—Displays the percentage of the fan maximum speed
- Water Valve—Displays the water valve state
- Cooling Module 1 through 3—Displays the Server Intake and Server Exhaust Temperature and the RPM of each cooling unit
- Water Inlet Temperature—Displays the temperature of the water coming into the MCS unit to be used to cool the servers
- Water Outlet Temperature—Displays the temperature of the water after removing the server heat
- Water Flow—Displays the value of the water flow in liters/gallons per minute

# Management module components

The management module is located on the inside of the MCS front door.




| Item | Reference | Description |
|---|---|---|
| 1 | C key | Used to confirm warnings, critical alarms, and configuration setting changes, as well as to turn off the audible alarm. Press and hold the **C** key for five seconds, or click the **Clear Alarms** button on the Web interface Setup tab>General menu, to confirm these situations. |

| Item | Reference | Description |
|---|---|---|
| 2 | Power/alarm LED | Used to indicate the internal status of the management module, and to signal warnings and critical alarms.<br>• If the LED is green, there is power to the management module and conditions are normal<br>• If the LED is green and blinking, communication is taking place<br>• If the LED is yellow, a warning has been issued<br>• If the LED is red, a critical alarm has been issued<br>• If the LED is blinking green, yellow and red, a configuration setting change has been made. Press and hold the **C** key for five seconds to save the new configuration settings to the internal memory of the management module.<br>• If the LED is off, there is no power to the management module |
| 3 | Traffic/link LED | Used to display the network connection.<br>• If the LED is green, there is a 10-MB connection.<br>• If the LED is yellow, there is a 100-MB connection.<br>• If the LED is green or yellow and blinking, data is being transferred.<br>• If the LED is off, there is no connection. |
| 4 | Serial communication port | Used to establish a serial connection (cable comes attached).<br>For more information, refer to "Serial interface (on page 37)." |

# Accessing the management module through a terminal emulation program

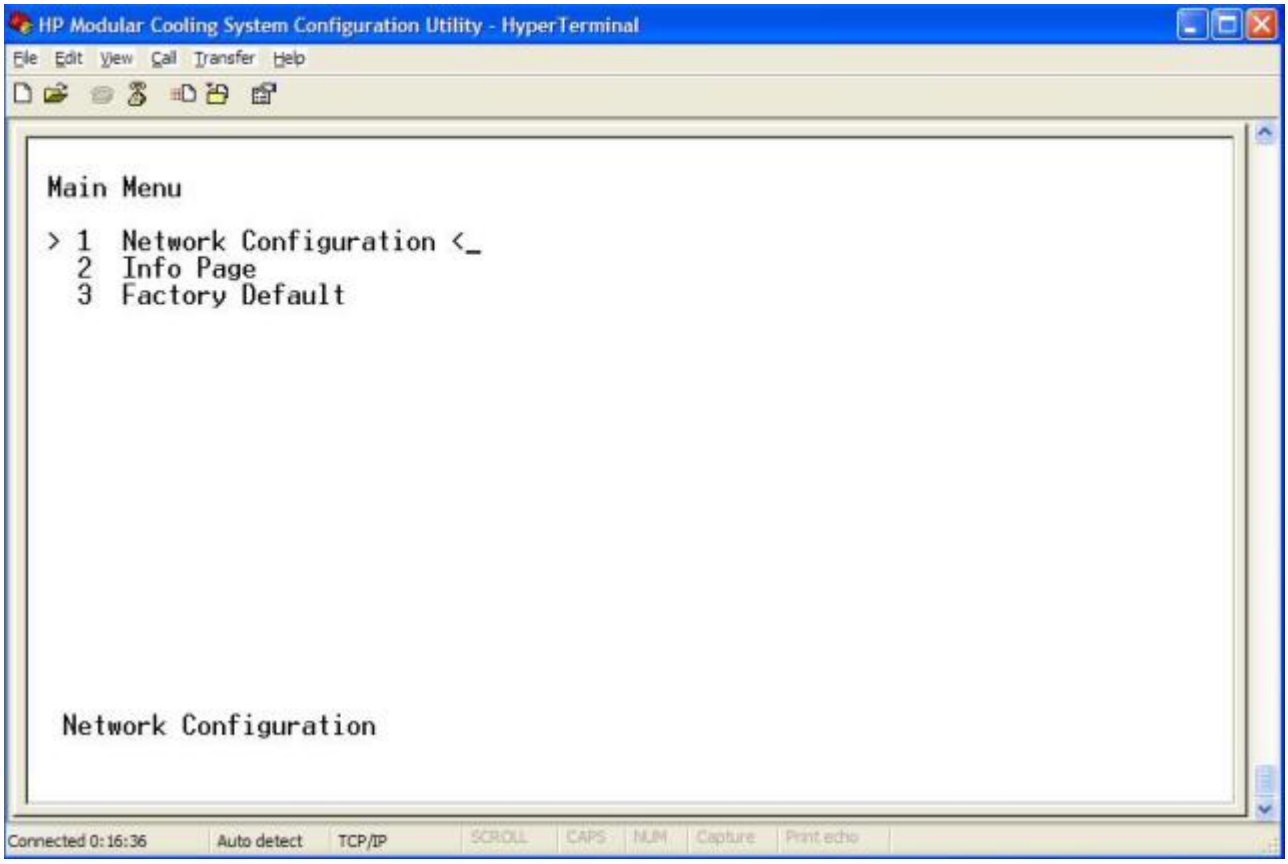
1. Verify that a serial cable is connected between the management module and a host computer.
2. Launch a terminal emulation program, such as HyperTerminal ("Configuring HyperTerminal" on page 43) or Minicom.

   For information about configuring the management module, see the *HP Modular Cooling System Web Interface User Guide*.
3. Log in through the terminal emulation program ("Logging in through the terminal emulation program" on page 32).

# Logging in through the terminal emulation program

1. Enter the user name in the login field. The default user name is `Admin`.

2. Enter the password in the password field. The default password is `Admin`. The Main Menu screen appears.




# Accessing the management module through the web interface

1. Launch a supported browser. The browser window appears.
2. In the Address field (Microsoft® Internet Explorer) or the Location field (Mozilla), enter one of the following:

   `http://`*hostname[:port number]*

   -or-

   `https://`*hostname[:port number]* (if SSL is enabled)

   where *hostname* is the IP address of the management module and *port number* is the port number if using a port other than the default 80 for http and 443 for https. The login screen appears.
3. Log in through the web browser.

# Web interface requirements

The following table lists the minimum requirements necessary to operate the web interface.

| Software | Browser |
|---|---|
| Web browser on a client | • Microsoft® Internet Explorer 6.0 with Service Pack 1 (32-bit only)<br>• Red Hat Linux operating system (32-bit only)<br>• Mozilla 1.4<br>• SUSE LINUX operating system (32-bit only)<br>• Mozilla 1.6 |
| Monitor resolution | Minimum supported resolution of 1024 x 768, 16-bit high color (maximize browser window for optimal display) |
| Desktop resolution | SLES 9 Mozilla 1.6<br>1 Right-click the mouse, and select **Configure Desktop.**<br>2 Select **1152 x 864.**<br>3 Select **75 Hz.** |

# Logging in through the web interface

1. Enter the user name in the User Name field. The default user name is `Admin`.

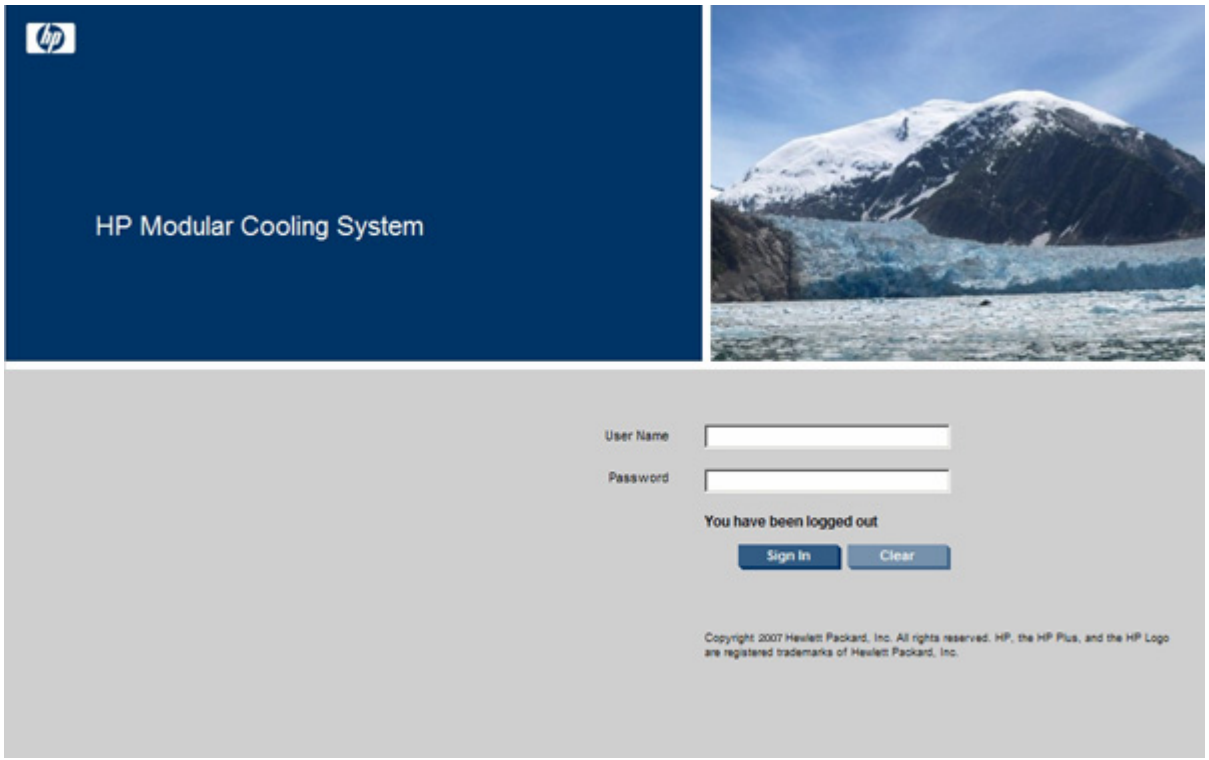
   **NOTE:** Passwords are case-sensitive.

2. Enter the password in the Password field. The default password is `Admin`.
3. Click **Sign In.** The HP Modular Cooling System web interface appears.

   -or-

   Click **Clear** to clear the credentials.

For instructions on changing the password, see the "Accounts menu" section in the *HP Modular Cooling System Web Interface User Guide*.


HP Modular Cooling System
User Name
Password
You have been logged out
Sign In
Clear
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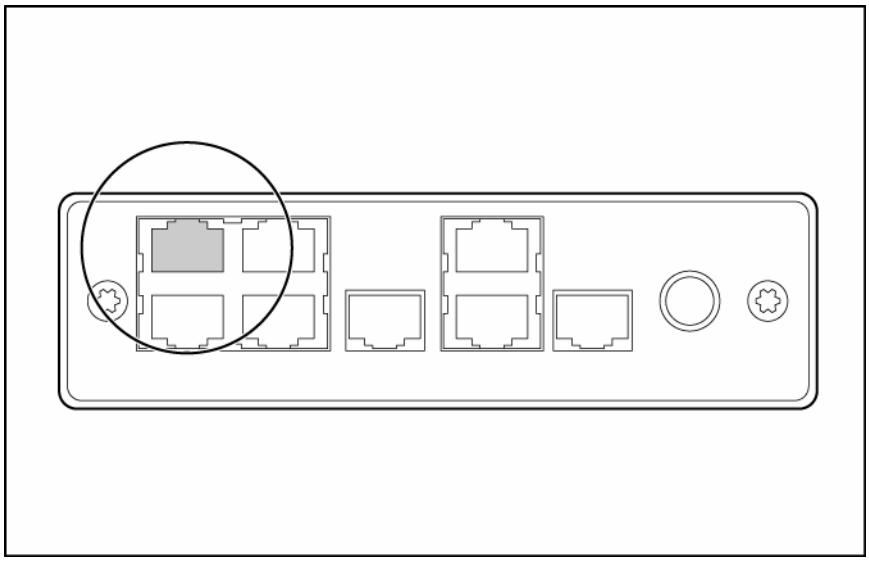
Only one Admin session and one User session are supported at a time. Sessions can be terminated if a second session is initiated (after successful login), or if a console session timeout occurs. In both situations, the existing session is terminated and the login screen appears. Admin session logins, logouts, and terminations are recorded in the Event Log menu. The console session timeout length can be enabled, disabled, or modified in the Remote Access tab. The default is 30 minutes.

# Connecting an external alarm relay

The external alarm relay must be ordered separately from the MCS unit, and can be purchased by visiting the Rittal website (http://www.Rittal.com), and searching for the part number DK7320.590.

To add an external alarm relay:

1. Connect the external alarm relay module to the sensor jack 1 (see figure below) on the management module according to the instructions provided with the device. The management module LED status light will blink red, yellow, and then green.



2. Press and hold the management module C key for five seconds to confirm the new settings. The management module LED status light turns green when the external alarm relay is ready.
3. Test the external alarm relay by setting the High Temperature Threshold lower than the normal settings from the web interface, and confirm that the alarm is generated.
4. Once the test is complete, return the High Temperature Threshold to its normal setting.

# Serial interface

In this section

HP Modular Cooling System Utility overview ..... 37
Configuring HyperTerminal ..... 43
Configuring Minicom ..... 44

# HP Modular Cooling System Utility overview

The HP Modular Cooling System Configuration Utility is used for entering network settings, accessing controls, reviewing the details on the info page, and resetting to factory defaults.

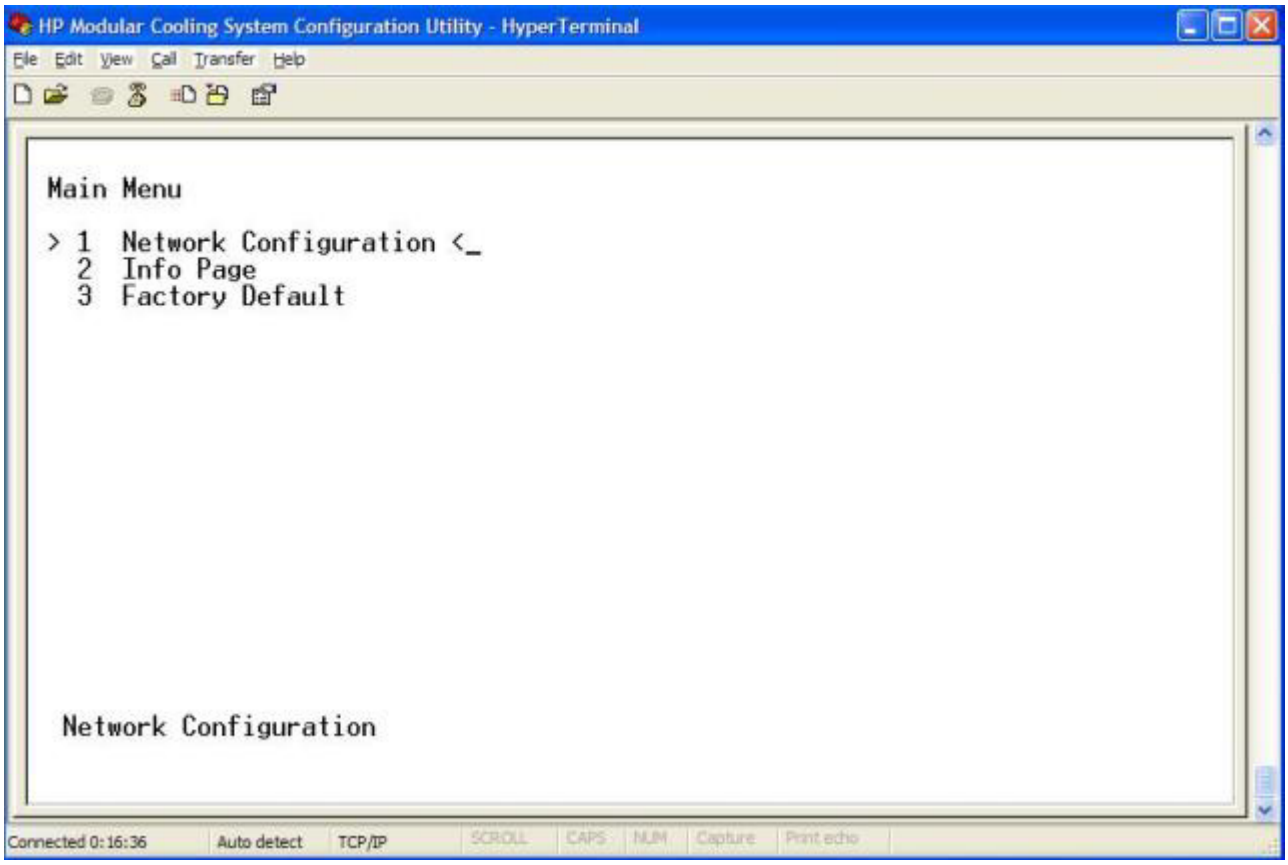
First, log in to a terminal emulation program. ("Logging in through the terminal emulation program" on page 32) After you have successfully initiated a terminal emulation session, the HP Modular Cooling System Configuration Utility appears.

- Open a submenu by entering the corresponding option number at the prompt.
- Enter or change configuration information by following the onscreen prompts.
- Press **Esc** or enter `0` at the submenu prompt to go to the previous menu.

  -or-

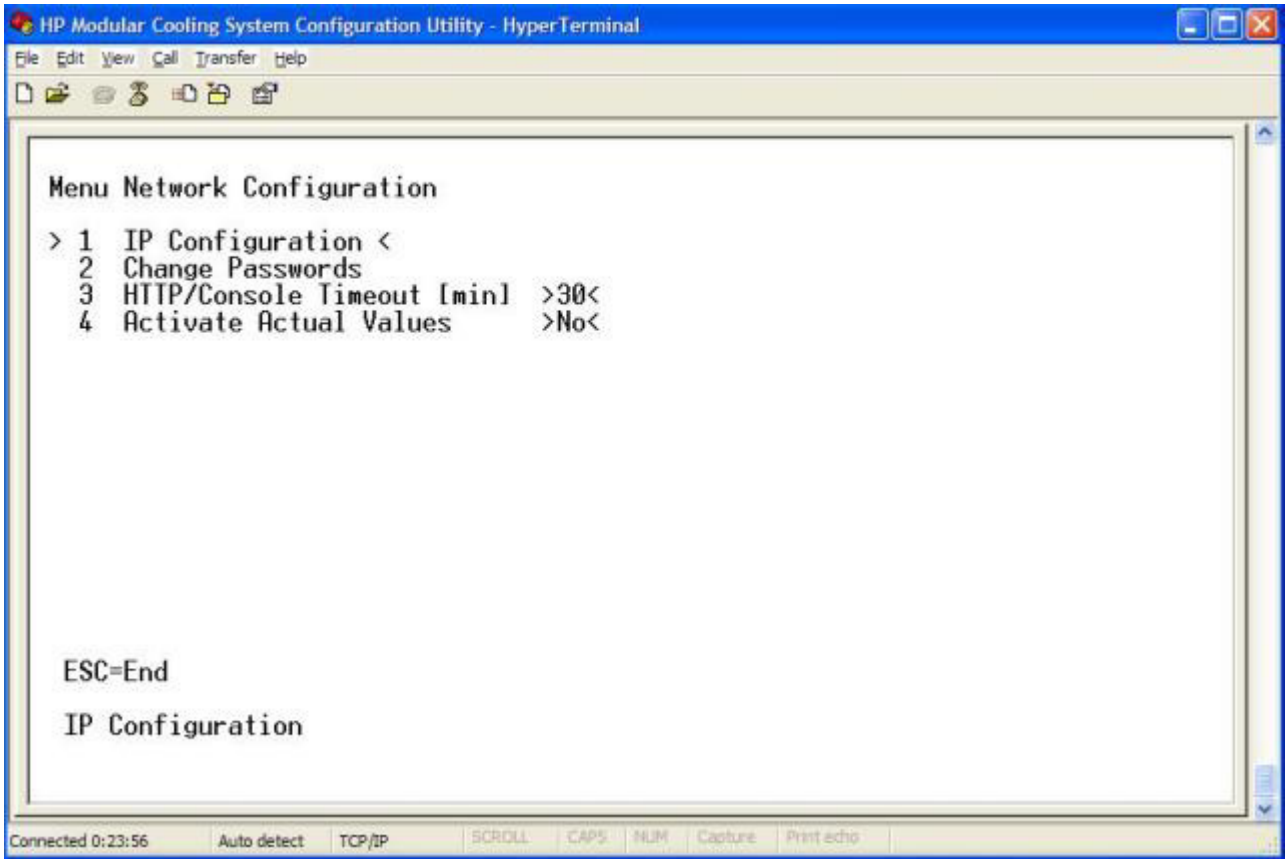
  Press **Esc** or enter `0` at the main menu prompt to exit the utility.
- The management module must be reset before configuration changes can take effect.

# Main menu



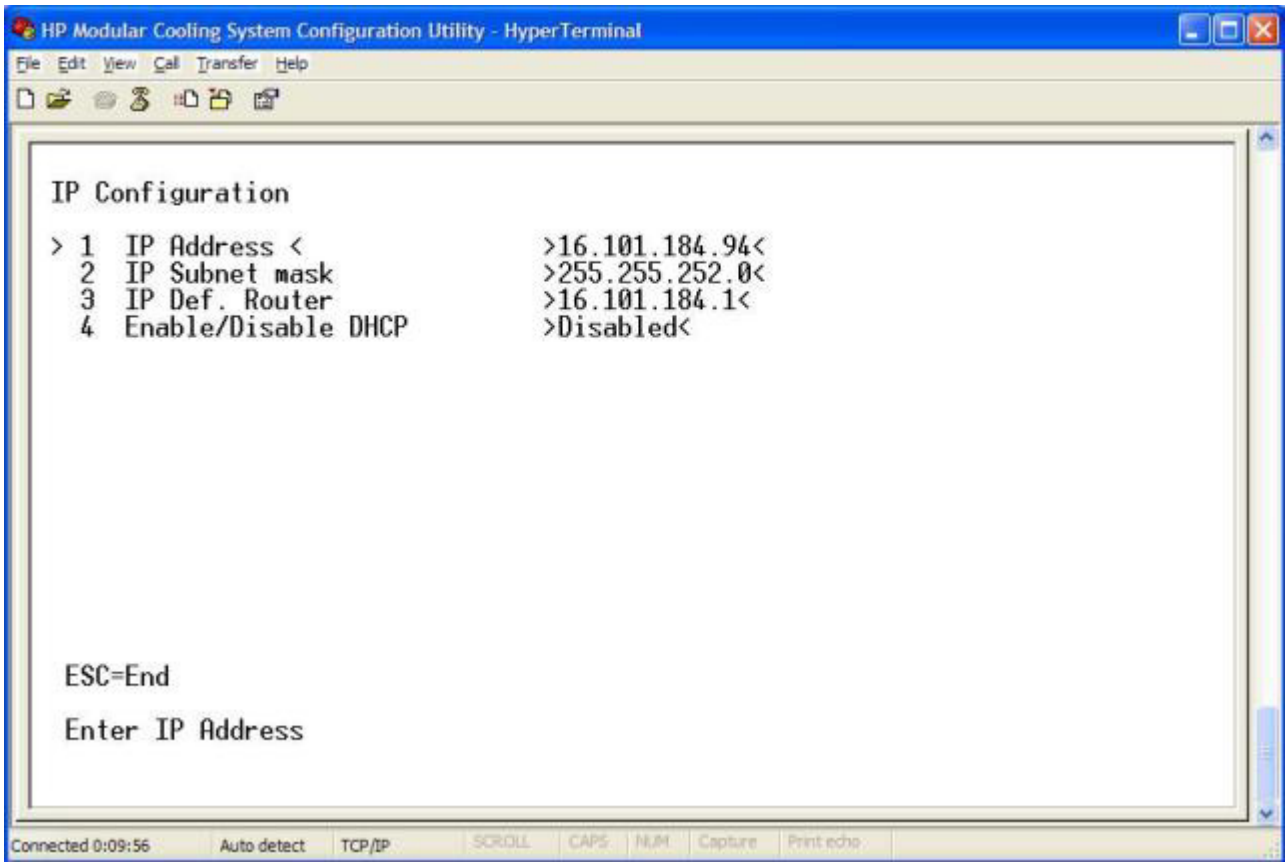

| Option number | Submenu | Description |
|---|---|---|
| 1 | Network Configuration | Enter or change network properties for the management module. |
| 2 | Info Page | View parameters for the management module. |
| 3 | Factory Default | Change parameters back to default settings. |

## Menu Network Configuration submenu



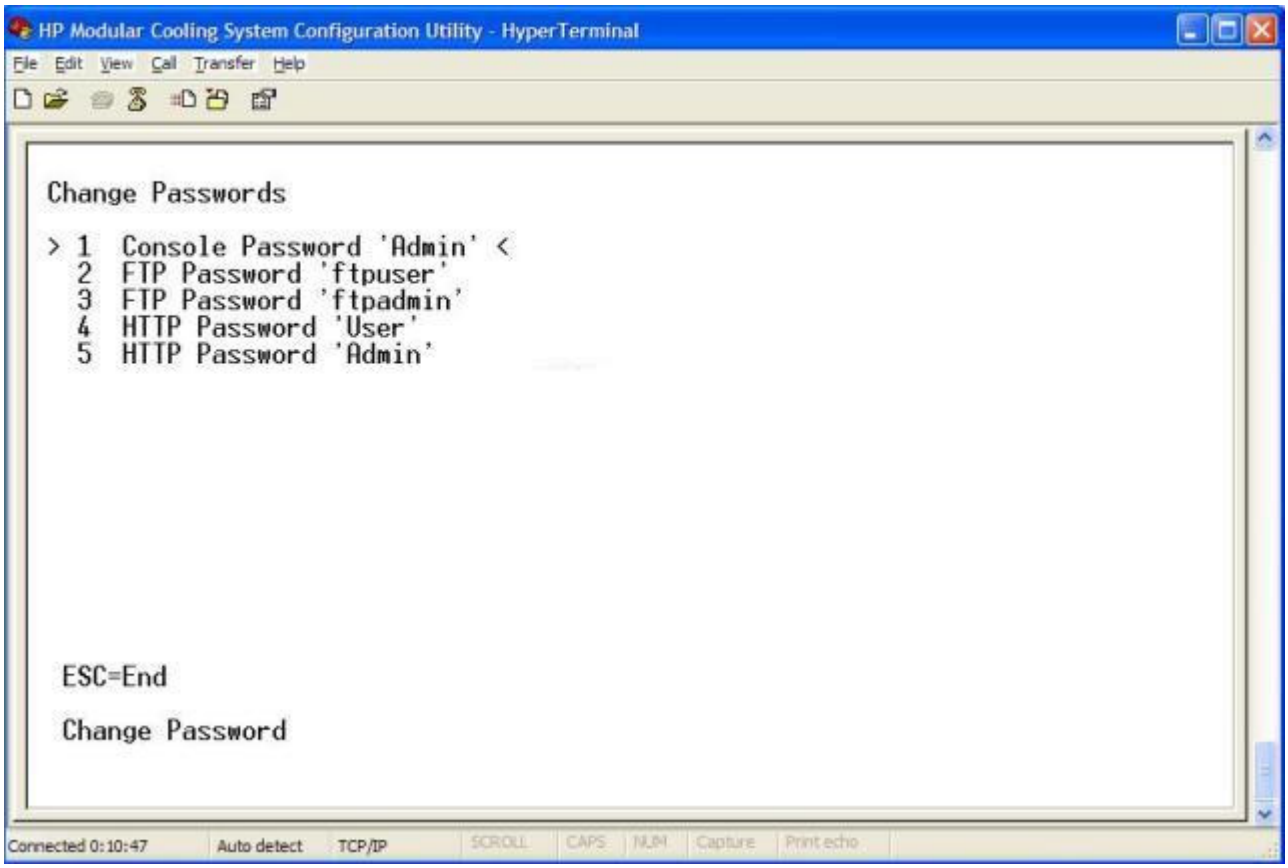

| Option number | Submenu | Description |
|---|---|---|
| 1 | IP Configuration | Enter or change the IP configuration for the management module. |
| 2 | Change Passwords | Enter or change the passwords for the management module. |
| 3 | HTTP/Console Timeout [min] | Enter or change the minimum HTTP/console timeout for the management module. |
| 4 | Activate Actual Values | Select to accept changes and restart the unit. |

## IP Configuration submenu



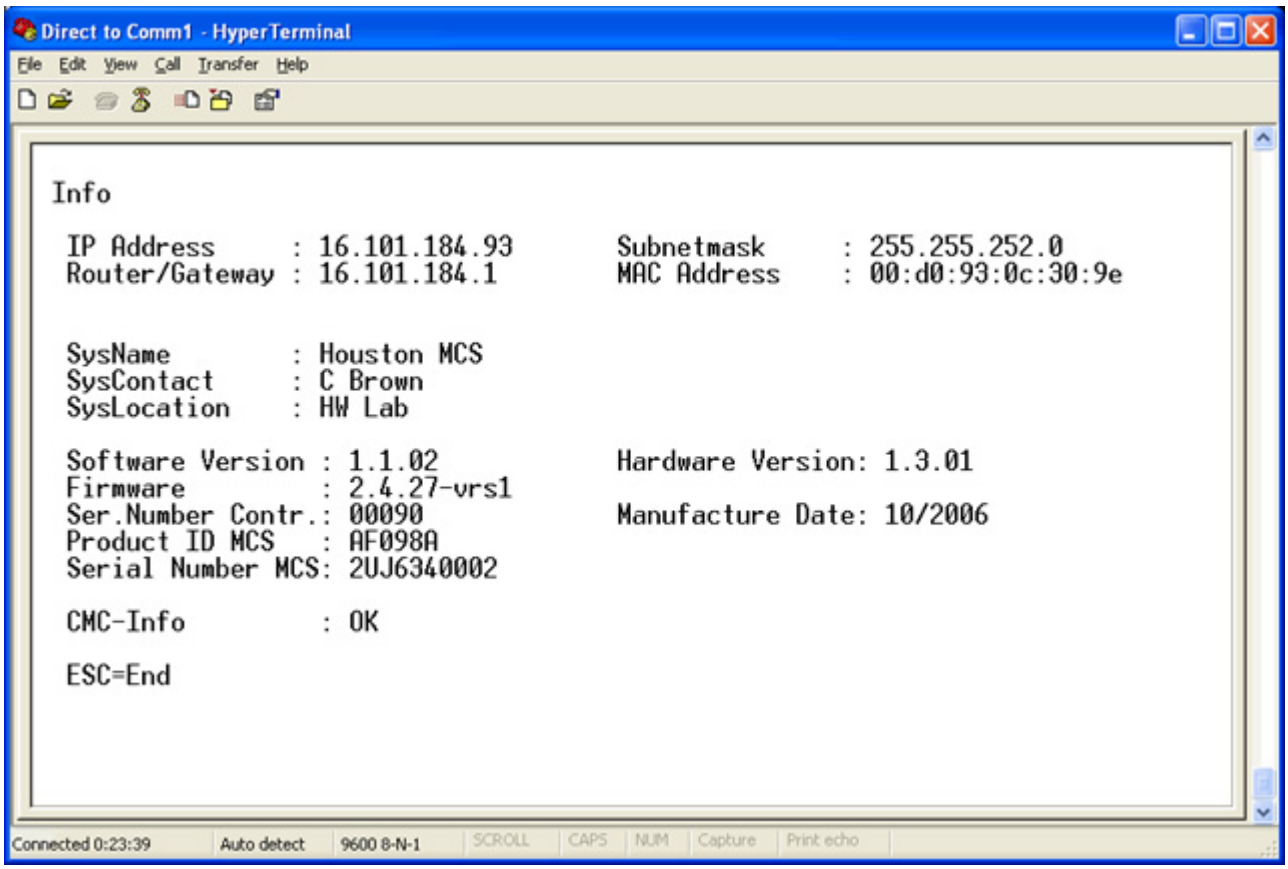

| Option number | Submenu | Description |
|---|---|---|
| 1 | IP Address | Enter or change the IP address for the management module. |
| 2 | IP Subnet mask | Enter or change the subnet mask for the management module. |
| 3 | IP Def. Router | Enter or change the default router for the management module. |
| 4 | Enable/Disable DHCP | Select to enable or disable DHCP. |

## Change Passwords submenu




| Option number | Submenu | Description |
|---|---|---|
| 1 | Console Password 'Admin' | Change the Admin password. |
| 2 | FTP Password 'ftpuser' | Change the FTP user password. |
| 3 | FTP Password 'ftpadmin' | Change the FTP Admin password. |
| 4 | HTTP Password 'User' | Change the HTTP user password. |
| 5 | HTTP Password 'Admin' | Change the HTTP Admin password. |

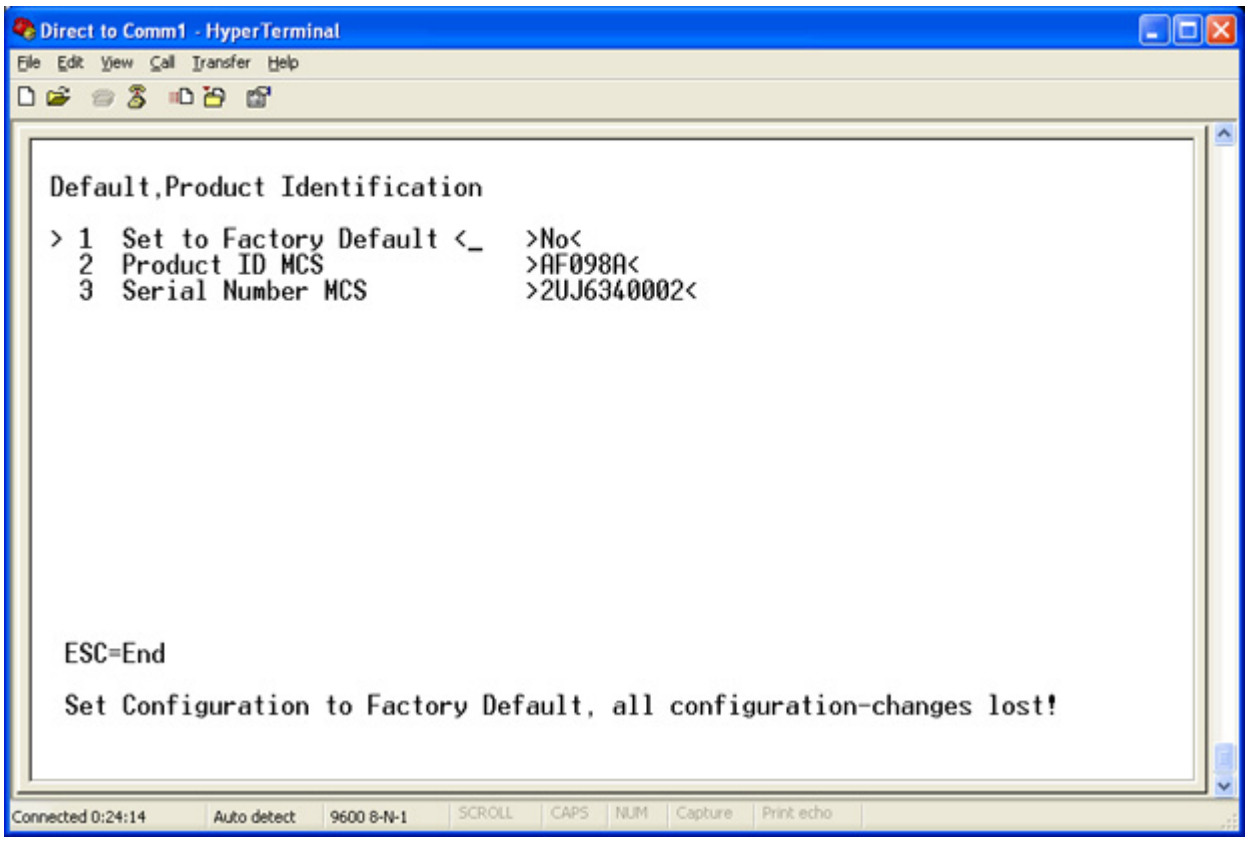
## Info page




The Info page displays the following parameters:

- IP Address
- Subnetmask
- Router/Gateway
- MAC Address
- SysName
- SysContact
- SysLocation
- Software Version
- Hardware Version
- Firmware
- Serial Number
- Manufacture Date
- CMC-Info

## Factory Default submenu




| Option number | Submenu | Description |
|---|---|---|
| 1 | Set to Factory Default | Set the management module to factory default. |
| 2 | Product ID MCS | Set the MCS unit product ID. |
| 3 | Serial Number MCS | Set the MCS unit serial number. |

# Configuring HyperTerminal

1. From the Microsoft® Windows® desktop menu, click **Start>All Programs>Accessories>Communication>HyperTerminal.** The Connection Description window appears.
2. Enter a description and select an icon for the connection. The Connect To window appears.
3. Select the Com port through which to connect. The Com Properties window appears.
4. Select the following parameter values.

| Parameter | Value |
|---|---|
| Transmission rate | 9600 Bps |
| Data bits | 8 |
| Parity | None |
| Stop bits | 1 |
| Flow control | None |

5. When a connection is established, press **Enter** and then log in. The Main menu for the management module appears. Follow the onscreen options to configure the management module.

# Configuring Minicom

**NOTE:** The following example uses Red Hat Linux 3.0. For more information, refer to your Linux operating system Help or documentation.

**IMPORTANT:** Minicom is a utility that is loaded during the installation of Linux. However, if you do not select the option to install the Linux Utilities during the operating system installation, you cannot use Minicom without downloading the Minicom X.X.i386.rpm file from the Red Hat website. (Refer to the procedure for installing RPMs on the Red Hat website.)

1. Log in to a Linux console, or open a terminal and enter `minicom-s` at the command prompt. The Configuration menu appears.
2. Select **Serial Port Setup.** The Change which setting? menu appears.
3. Select **Option A (Serial Device).** Manually change the device type from "dev/modem" to "/dev/ttyS0" and press **Enter**.
4. Select **Option E (Bps/Par/Bits).** The Comm Parameters menu appears.
5. Select **E (Speed 9600 Bps),** and press **Enter**. The designation 9600 8 N1 appears next to Option E.
6. Select **Option F (Hardware Flow Control).**
7. Be sure that the Change which setting? menu is configured as follows:
   - A—Serial Device: /dev/ttyS0
   - B—Lockfile Location: /var/lock
   - C—Callin Program:
   - D—Callout Program:
   - E—Bps/Par/Bits: 9600 8 N1
   - F—Hardware Flow Control: No
   - G—Software Flow Control: No
8. Press **Enter** to return to the Configuration menu. Scroll down to the Save setup as default option, and press **Enter**. Scroll down the Configuration menu to the Exit from the Minicom option, and press **Enter**.
9. From the command prompt, enter `Minicom`. As soon as a connection is established, press **Enter** and log in. The Main menu for the management module appears. Follow the onscreen options to configure the management module.

# Operator display

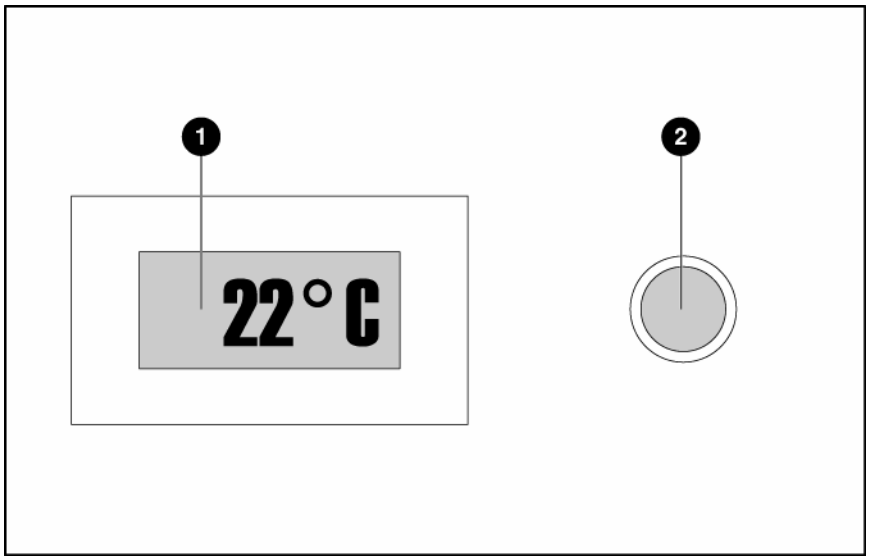
In this section

Operator display overview ..... 45
Adjusting the operator display ..... 55

# Operator display overview

The operator display provides information on the system operation, viewable on the outside of the MCS front door. When the management module issues an alarm or warning, the warning and alarm messages display ("Warning and alarm messages" on page 45) on the operator display, as well as on the web interface Alarms menu and Alarm History menu.

## Operator display components




| Item | Reference |
|---|---|
| 1 | Operator display window |
| 2 | Scroll button |

## Warning and alarm messages

The following tables describe the possible warning and alarm messages that are sent to the management module from the MCS unit and appear on the operator display, and on the web interface Alarms menu and Alarm History menu.

**Fan unit failed**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Top, Mid, or Bot Fan Mod. Failed |
| Actual web interface alarm message | Top, Mid, or Bottom Fan Module Failed |
| Condition | Top, middle, or bottom fan module tach is less than its minimum rpm |
| Module | Top, middle, or bottom fan module |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Remove the fan unit.
2. Reinstall the same fan unit.

If the warning message does not clear after the module is reseated, replace the fan unit with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**Fan unit not installed**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Top, Mid, or Bot Fan Not installed |
| Actual web interface alarm message | Top, Middle, or Bottom Fan Not installed |
| Condition | Failed connection to the fan unit sensors over the I²C bus (possible open circuit) |
| Modules | Top, middle, or bottom fan module |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Remove the fan unit.
2. Reinstall the same fan unit.

If the warning message does not clear after the module is reseated, replace the fan unit with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**HEX (heat exchanger unit) temperature in failed (Server Intake Temperature failed)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | HEX1, HEX2, or HEX3 Temp. In Failed |
| Actual web interface alarm message | Top Heat Exchanger Intake Air Temperature Sensor to Server Failed |
| Condition | Temperature reading is beyond limit (possible open circuit) |

| Indicators | Meaning |
|---|---|
| Sensors | HEX1, HEX2, or HEX3 sensors (this is the water to air heat exchanger unit temperature of the intake to the servers) |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Remove the fan unit.
2. Remove the HEX unit.
3. Reinstall the same HEX unit.
4. Reinstall the same fan unit.

If the warning message does not clear after the module is reseated, replace the HEX unit with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**HEX temperature out failed (Server Exhaust Temperature failed)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | FAN1, FAN2, or FAN3 Temp. Out Failed |
| Actual web interface alarm message | Top Fan Exhaust Air Temperature Sensor from Server Failed |
| Condition | Temperature reading is beyond limit (possible open circuit) |
| Sensors | FAN1, FAN2, or FAN3 sensors (this is the fan unit temperature of the exhaust from the servers) |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Remove the fan unit.
2. Reinstall the same fan unit.

If the warning message does not clear after the module is reseated, replace the fan unit with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**Air temperature sensor failed**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Air Temp. Sens Failed |
| Actual web interface alarm message | Air Temperature Sensor Failed |
| Condition | Single air temperature sensor is significantly different from the others |
| Sensors | Air temperature sensors |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. View the Overview menu to distinguish which temperature sensor is different from the other temperature sensors.
2. After discovering which temperature sensor is not working properly, remove that module and reinstall it. If the difference is in the Server Exhaust Temperature, replace the appropriate fan unit. If the difference is in the Server Intake Temperature, replace the appropriate HEX unit.

If the warning message does not clear after the module is reseated, replace the HEX unit with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**Low water flow**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Water flow Low |
| Actual web interface alarm message | Water flow Low |
| Condition | No or low water flow |
| Modules | Water group |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

Verify the water supply.

**Water temperature input is out of range**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Water Temp. In Failed |
| Actual web interface alarm message | Water Unit Temperature Input Out of Range |
| Condition | Water temperature sensor is not working properly (possible open circuit) |
| Sensors | Water group sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify the water supply.
2. Verify whether the water temperature is below or above the water temperature expected range.
3. Contact your building supervisor.
4. Contact HP, or see the HP website (http://www.hp.com).

**Water temperature output is out of range**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Water Temp. Out Failed |
| Actual web interface alarm message | Water Unit Temperature Output Out of Range |
| Condition | Water temperature sensor is not working properly (possible open circuit) |
| Sensors | Water group sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify the water supply.
2. Verify whether the water temperature is below or above the water temperature expected range.
3. Contact your building supervisor.
4. Contact HP, or see the HP website (http://www.hp.com).

**Water flow sensor is not working properly**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Water flow Sensor ? |
| Actual web interface alarm message | Water flow Sensor Value Out of Range |
| Condition | Water flow sensor is not working properly |
| Sensor | Water group |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify the water supply.
2. Contact HP, or see the HP website (http://www.hp.com).

**Water flow valve is closed**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Water Valve ? |
| Actual web interface alarm message | Water Valve Failed |
| Condition | Water flow valve is closed and water flow is detected |
| Modules | Water group |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify the water valve is closed.
2. Contact HP, or see the HP website (http://www.hp.com).

**Leak detector sensor is not working properly**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Leak detector? |
| Actual web interface alarm message | Leak detector Failed |
| Condition | Leak detector sensor is not working properly |
| Sensors | Leak detector sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

Contact HP, or see the HP website (http://www.hp.com).

**Uneven heat load**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Heat Load? |
| Actual web interface alarm message | Heat Load Warning |
| Condition | Measured air temperature values dramatically different from top to bottom |
| Sensors | Air temperature sensors |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify that nothing is blocking the heat path.
2. Verify that the server is loading.
3. Adjust the Temperature Difference for Heat Load Warning in the Advanced tab.

**Heat overload condition (High Temperature Threshold field)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Temperature Warning |
| Actual web interface alarm message | Temperature Warning |
| Condition | Heat overload condition |
| Modules or sensors | Average server air temperature is above the temperature assigned in the web interface Intake Temp tab High Temperature Threshold field |
| SNMP notification | Critical |
| Type of message | Alarm |

Solution:

1. Verify the water inlet temperature.
2. Verify that the flow matches the specifications required for heat load.
3. Adjust the temperature assigned in the web interface Intake Temp tab High Temperature Threshold field.

**Leakage detected**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Leakage Detected |
| Actual web interface alarm message | Leakage Detected |
| Condition | Leak is detected |
| Modules or sensors | Leakage detector actuated |
| SNMP notification | Critical |
| Type of message | Alarm |

Solution:

1. Open the rack doors.
2. Power down the rack-mounted components.
3. Turn off the water to the MCS unit.
4. Locate the leak and correct it.

**Communication failure**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Comm. Failure I²C |
| Actual web interface alarm message | Comm. Failure I²C |
| Condition | Management module cannot communicate with the MCS unit sensors |
| Modules or sensors | Any module or sensor |
| SNMP notification | Critical |
| Type of message | Alarm |

Solution:

Power cycle the management module. If the alarm message continues to display, replace the management module with a CSR part. For more information on CSR parts, see "Replaceable parts and maintenance and service information (on page 63)."

**Temperature below threshold (Low Temperature Threshold field)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Temperature Too low |

| Indicators | Meaning |
|---|---|
| Actual web interface alarm message | Temperature too low |
| Condition | Average server air temperature is lower than the temperature assigned in the web interface Intake Temp tab Low Temperature Threshold field |
| Sensors | Air temperature sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify water flow matches specifications required for heat load.
2. Verify whether the water temperature is below the expected range.
3. Adjust the temperature assigned in the web interface Intake Temp tab Low Temperature Threshold field.
4. Contact your building supervisor.

**Temperature above threshold (Warning Temperature Threshold field)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Temperature Too high |
| Actual web interface alarm message | Temperature too high |
| Condition | Average server air temperature is above the temperature assigned in the web interface Intake Temp tab Warning Temperature Threshold field |
| Modules or sensors | Air temperature sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Verify water flow matches specifications required for heat load.
2. Verify whether the water temperature is above the expected range.
3. Adjust the temperature assigned in the web interface Intake Temp tab Warning Temperature Threshold field.
4. Contact your building supervisor.

**Emergency Door Opening due to Water Flow Loss (0 l/min; 36/34/35°C) (0 gal/min; 97/93/95°F)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Emergency Door, Flow |
| Actual web interface alarm message | Emergency Door Opening due to Water Flow Loss (0 l/min; 36/34/35°C) (0 gal/min; 97/93/95°F)<br>Note: The interface alarm message displays the temperatures of the top, middle, and bottom fans so you can see which temperature has been exceeded and caused the alarm to trip. |

| Indicators | Meaning |
|---|---|
| Condition | The Water Flow Loss Emergency Door Opening Temperature Threshold has been exceeded or the water flow is less than 2 l/min (.5283 gal/min). |
| Modules or sensors | Server Intake Temperature, Water Flow Meter |
| SNMP notification | Critical |
| Type of message | Alarm |

Solution:

1. Verify water supply and verify the MCS unit is receiving water.
2. Verify that the water flow is at least 2 l/min (.5283 gal/min) or greater.
3. Verify that the Water Flow Loss Emergency Door Opening Temperature Threshold is not less than 5°C (9°F) above or more than 20°C (36°F) above the Server Intake Temperature Set Point.
4. Adjust the temperature in the Server Intake Temperature Set Point or the Water Flow Loss Emergency Door Opening Temperature Threshold fields to prevent false alarms.

**IMPORTANT:** Use caution when entering temperatures in the Emergency Door Opening fields. Setting the temperature thresholds too low might cause the MCS unit to shut down.

**Emergency Door Opening due to High Temperature (35/36/38°C) (95/97/100°F)**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Emergency Door, Heat |
| Actual web interface alarm message | Emergency Door Opening due to High Temperature (35/36/38°C) (95/97/100°F)<br>Note: The interface alarm message displays the temperatures of the top, middle, and bottom fans so you can see which temperature has been exceeded and had caused the alarm to trip. |
| Condition | The High Temperature Emergency Door Opening Threshold has been exceeded. |
| Modules or sensors | Server Intake Temperature |
| SNMP notification | Critical |
| Type of message | Alarm |

Solution:

1. Verify water supply and verify the MCS unit is receiving water.
2. Verify that the High Temperature Emergency Door Opening Threshold is not less than 5°C (9°F) above or more than 20°C (36°F) above the Server Intake Temperature Set Point, or that it is not below the Water Flow Loss Emergency Door Opening Temperature Threshold.
3. Adjust the temperature in the Server Intake Temperature Set Point or the Water Flow Loss Emergency Door Opening Temperature Threshold fields to prevent false alarms.

**IMPORTANT:** Use caution when entering temperatures in the Emergency Door Opening fields. Setting the temperature thresholds too low might cause the MCS unit to shut down.

**The condensation pump has exceeded x cycles**

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Excessive Moisture |
| Actual web interface alarm message | The condensation pump has exceeded x cycles |
| Condition | The water level has exceeded the permissible level of the condensation pump sensor |
| Modules or sensors | Condensation pump sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Look for leaks or determine if condensation is the cause.
2. If no leaks are found, adjust the temperature in the Excessive Moisture: Condensation Pump Cycles Warning Threshold field.

**IMPORTANT:** Use caution when entering temperatures in the Condensation Pump Threshold fields. Be sure to determine the proper default settings to prevent false alarms, without masking problems with the MCS.

Default settings will vary, depending on the humidity level of your data center and the heat load generated by the equipment in the MCS.

### The condensation pump has run more than x seconds

| Indicators | Meaning |
|---|---|
| Actual operator display alarm message | Excessive Moisture |
| Actual web interface alarm message | The condensation pump has run more than x seconds |
| Condition | The water level has exceeded the permissible level of the condensation pump sensor. |
| Modules or sensors | Condensation pump sensor |
| SNMP notification | Warning |
| Type of message | Warning |

Solution:

1. Look for leaks or determine if condensation is the cause.
2. If no leaks are found, adjust the temperature in the Excessive Moisture: Condensation Pump Running Time Warning Threshold field.

**IMPORTANT:** Use caution when entering temperatures in the Condensation Pump Threshold fields. Be sure to determine the proper default settings to prevent false alarms, without masking problems with the MCS.

Default settings will vary, depending on the humidity level of your data center and the heat load generated by the equipment in the MCS.

**NOTE:** A 24-hour clock starts when the condensation pump runs for the first time in more than 24 hours. A warning is issued if either the cycle threshold or pump running time is exceeded within the 24-hour window. The clock stops and the counters are reset to zero for warning purposes if the thresholds are not exceeded within 24 hours after the last time the condensation pump runs.

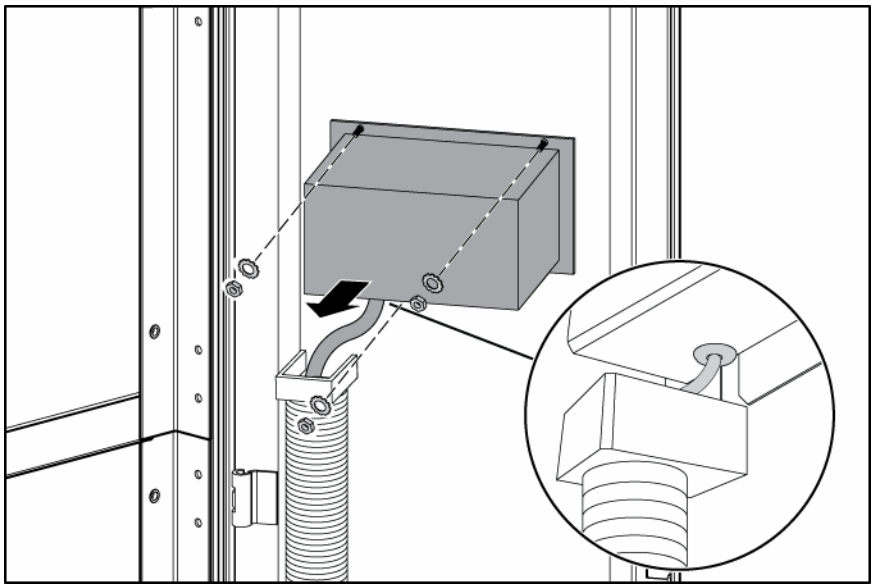
**NOTE:** To clear the condensation pump cycles warning, click **Cooling System** in the left navigation frame to access the Cooling System screen, and then click the **Alarms/Warnings** tab. Under the Warnings section, set Alarm Reset to **Manual** and click **Save Settings**. Then, return to the General menu and click **Clear Alarms**.

This step only clears the warning when the condensation pump is not running.

# Adjusting the operator display

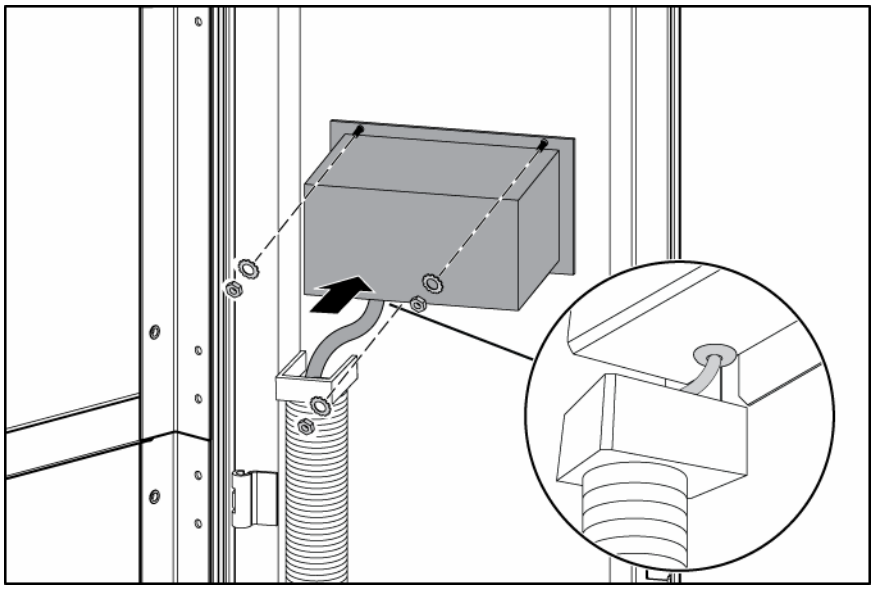
To optimize the operator display contrast:

1. Using an 8-mm wrench, remove the three nuts securing the operator display rear cover to the back of the MCS front door.
2. Remove the operator display rear cover.



3. Using a small flathead screwdriver, rotate the dial counter-clockwise to increase the contrast or clockwise to decrease the contrast.

4. Using an 8-mm wrench, reattach the three nuts removed in step 1 to replace the operator display rear cover.



# Automatic Door Release Kit

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# Automatic Door Release Kit Overview

The Automatic Door Release Kit is designed as a safety mechanism in the event that the MCS unit shuts off unexpectedly. If the MCS unit shuts off unexpectedly, the electromagnetic locks on the front door, the rear master door, and the rear slave door are immediately deactivated. This deactivation of the electromagnetic locks will cause the release springs on each door to spring the rack doors open, and allow air flow and cooling to the servers in the rack.

The Automatic Door Release Kit is included with your MCS unit. For specific installation instructions, see the *HP Modular Cooling System Automatic Door Release Kit Installation Instructions* included with the kit.

# Frequently asked questions

In this section

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# HP Modular Cooling System frequently asked questions

| Question | Answer |
|---|---|
| What cooling capacity ranges are available in the MCS unit? | The cooling capacity of the heat exchanger units depends on the water supply temperature and the server inlet set point. The MCS unit is capable of cooling rack-mounted components consuming up to 35 kW of electrical power. |
| Is special IT equipment required for use with the MCS unit? | No, all IT equipment that uses the front-to-back cooling system (99% of IT equipment) can be used without restriction in conjunction with the MCS unit. |
| Does the additional heat from the MCS unit increase the room temperature? | In some cases, up to 10% of the total power supplied to the rack may be lost to the room, depending on the server air setting and the room temperature. |
| Can the level of heat removal be regulated in proportion to the waste heat generated? | Yes, the control system automatically adjusts the water flow and air flow to remove heat generated in the rack. |
| How is water connected to the MCS unit? | The water is connected to the unit using a 1 1/4 in flexible hose and quick-disconnect automatic shutoff hose fittings. For more information, see the *HP Modular Cooling System Site Preparation Guide* on the HP website. |
| Can the MCS unit operate with the front or rear door open? | Yes, due to the air curtain effect, the air will function normally with little air lost. When the doors are open during operation, room air mixes with air supplied to the servers. |
| Does the MCS unit require maintenance? | No, assuming that the water quality is maintained, the MCS unit is maintenance-free. For more information about water quality, see the *HP Modular Cooling System Site Preparation Guide* on the HP website. |
| Is a false floor necessary? | No, a false floor is not necessary to operate the MCS unit. For more information, see the *HP Modular Cooling System Site Preparation Guide* on the HP website. |
| Does condensation form? | During normal operation some condensation may form, but the MCS unit condensation control system ensures that the condensation does not reach any rack-mounted components or cause any damage. In most cases, the condensation evaporates prior to reaching the MCS unit condensation control system. |
| How does the MCS unit control humidity? | There is some room-air interchange, so the moisture content of the air inside the unit is the same as the room. |

| Question | Answer |
| --- | --- |
| Does the air flow within the MCS unit produce static electricity? | Very low humidity levels in the chilled air may produce static electricity. However, static electricity is not a problem if the MCS unit is operated at the specified settings located in the *HP Site Preparation Guide* and the Environmental specifications listed in this document. |
| Why do I get an extra line feed sent from Windows when I access the serial interface using an HP serial console switch? | Enter these commands while logged in as Admin on the HP serial console switch console port (where port x is the port connected to the MCS management module):<br>`port x set out lf=strip`<br>`port x set flow=Xonxof` |
| Is water prevented from entering the MCS unit if a pipe breaks? | Yes, the MCS unit is physically separate from the server enclosure. Therefore, there is no situation in which water can come directly in contact with the servers. The base unit of each cooling module acts as a condensation tray for water. These trays are connected together, so that any water drains away at once through the condensation drain. Also, each heat exchanger module has a leak and condensation tray that transfers water to the bottom of the MCS unit where it flows to the building condensation return system. If a leak occurs, the integrated leak sensor detects it and an alarm would is issued so that action can be quickly taken. |
| What will happen if water stops flowing to the MCS unit? | If you have the Automatic Door Release Kit, an alarm will trigger the doors of the rack to open, allowing the servers to be cooled by the room ambient. |
| Can I install an MCS unit to an existing rack in my data center? | No, the MCS unit ships with an empty HP 10000 G2 rack. However, Configure to Order (CTO) is available. |

# Troubleshooting

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# HP Modular Cooling System troubleshooting

| Issue | Resolution |
|---|---|
| The water flow is low or not flowing. | For more information, see the "Temperature Control settings" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The fan speed is too low. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The fan speed is too high. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The average server intake temperature (air going to the servers) is too high. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The average server intake temperature (air going to the servers) is too low. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The average exhaust temperature (air coming out of the servers) is too high. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The average exhaust temperature (air coming out of the servers) is too low. | For more information, see the "Cooling performance parameters" section in the *HP Modular Cooling System Web Interface User Guide* located on the Documentation CD included with this product. |
| The settings that have been modified through the web interface are not accepted, and the management module LED is blinking red, yellow, or green. | Press and hold the management module C key for five seconds to confirm these settings. |
| The measurement readings on the management module display or web interface seem to be incorrect, and the management module LED is blinking red, yellow, or green. | Press and hold the management module C key for five seconds to confirm these settings. |
| The heat exchanger unit stops operating correctly. | Remove the corresponding fan unit to keep the Automatic Door Release Kit from holding the rack doors open. |

# Specifications

In this section

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HP 10642 G2 Rack specifications ..... 62

# MCS specifications

| Item | Specification |
|---|---|
| Voltage | 208–240 VAC +/- 10%, 50–60 Hz |
| Maximum Height (including the rack) | 200 cm (78.7 in) |
| Maximum Width (including the rack) | 90.9 cm (35.8 in) maximum |
| Maximum Depth (including the rack and rack handle) | 127 cm (50 in) |
| Maximum Shipping Height (on skid) | 224.8 cm (88.5 in) |
| Maximum Shipping Width (on skid) | 122 cm (48 in) |
| Maximum Shipping Depth (on skid) | 177.8 cm (70 in) |
| Maximum Depth with Rear Extension Kit installed | 142.5 cm (56.1 in) |
| Net Weight (including the empty rack) | 540 kg (1190 lb) |
| Shipping Weight (gross with packaging) | 621.4 kg (1370 lb) |
| Effective cooling with 75 l/min (20 gal/min) water supply at 7°C, cold air at 25°C | 35 kW |
| Rated current maximum | 208 VAC–15 Amps |
| Cooling medium | water |
| Minimum recommended water inlet temperature | 7°C (45°F) |
| Permissible operating pressure pmax | 100 psi |

# Thermal and air flow performance

| Maximum thermal and air flow performance parameters | Specifications |
|---|---|
| Air temperature—inlet to rack-mounted components | 25°C (68°F) |
| Chilled water temperature | 7°–10°C (45°–50°F) |
| Total rack-mounted component air flow | 2,600 cfm or less at 0 or more pressure drop across the rack-mounted components |
| Chilled water flow rate | 21 gal/min |
| Chilled water pressure differential at flow needed to meet thermal specifications | 2.0 bar delta pressure |
| Heat lost to room | approximately 10% maximum depending on the MCS settings and room temperature |
| Heat transferred to cooling fluid | 35 kW maximum |

# Environmental specifications

| Features | Specifications |
|---|---|
| Operating temperature | 5°C to 52°C (41°F to 95°F) |
| Non-operating temperature | 0°C to 60°C (32°F to 140°F) |
| Transit temperature | -30°C to 60°C (-22°F to 140°F), up to 72 hours |
| Storage temperature | -20°C to 60°C (-4°F to 140°F) |
| Operating humidity | 20 to 80% relative humidity (non-condensing) |
| Non-operating humidity | 5 to 95% relative humidity (non-condensing) |
| Operating altitude | -76.2 to 3,048 m (-250 to 10,000 ft) |
| Non-operating altitude | -76.2 to 9,144 m (-250 to 30,000 ft) |

# HP 10642 G2 Rack specifications

| U height | Width | Depth | Dynamic load (gross) | Static load |
|---|---|---|---|---|
| 42U | 600 mm (23.82 in) | 1,000 mm (39.37 in) | 907.18 kg (2,000 lb) | 907.18 kg (2,000 lb) |

# Replaceable parts and maintenance and service information

In this section

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## Replaceable parts

The heat exchanger units and fan units are replaceable during real-time operation. Other unit parts are also replaceable. For more information on replaceable parts and CSR parts, refer to Technical support (on page 68).

## Maintenance and service

For information on maintenance and service, refer to the HP website (http://www.hp.com).

### Air and water heat exchanger maintenance

The air and water heat exchanger requires no maintenance. If particulates are present in the cooling water, a filter must be fitted immediately upstream from the water inlet fittings. Check the functionality of the condensation drainage system regularly. Regularly perform visual inspections for leaks (annually).

# Water quality and leveling requirements, and condensation management

In this section

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Leveling requirements ..... 66
Condensation management ..... 67

# Water quality requirements and specifications

Tap water might be sufficient for some closed-loop systems. Water quality in a closed-loop system encounters problems with scaling, blockage, leaks, and corrosion that are typically found in tap water containing many chemicals and minerals. Determining the acceptable water quality range is the most essential element of the system requirements. For more information, see the *HP Modular Cooling System Site Preparation Guide* on the HP website (http://www.hp.com).

## Cooling water composition guidelines

- The closed-loop water must not contain any lime scale deposits or loose debris.
- The water should have a low level of hardness, particularly a low level of carbon hardness. However, the water should not be so soft that it attacks the materials with which it comes into contact.
- A 1-micron filter should be used to remove free floating particulates and regularly maintained.
- Salt content should be monitored because it rises over time as a result of evaporation in the systems, causing the water to become more corrosive. (Electrical conductivity increases as the concentration of dissolved substances rises.)
- Periodically some of the enriched water should be removed and new fresh water should be added to avoid the formation of Gypsiferous water, which is unsuitable for cooling purposes. Gypsiferous water has a tendency to form boiler scale, which is particularly difficult to remove.
- Cooling water should be free from iron and manganese because these minerals tend to settle in the pipes and cause blockage.
- The presence of organic impurities with algaecides and other inhibitors should be minimized to reduce the creation of sludge deposits and microbiological contamination.

## Acceptable water quality range

The following are water quality ranges required for continuous quality of performance for the MCS unit:

| **Hydrological data** | **Acceptable range** |
|---|---|
| pH value | 7–8.5 |
| Carbonic acid | > 3 < 8 °dH |

| Hydrological data | Acceptable range |
|---|---|
| Free carbonic acid | 8–15 mg/dm$^3$ |
| Accompanying carbonic acid | 8–15 mg/dm$^3$ |
| Corrosive carbonic acid | 0 mg/dm$^3$ |
| Sulphides | Free |
| Oxygen | < 10 mg/dm$^3$ |
| Chloride ions | < 50 mg/dm$^3$ |
| Sulphate ions | < 250 mg/dm$^3$ |
| Nitrates and nitrites | < 10 mg/dm$^3$ |
| CSB | < 7 mg/dm$^3$ |
| Ammonia | < 5 mg/dm$^3$ |
| Iron | < 0, 2 mg/dm$^3$ |
| Manganese | < 0, 2 mg/dm$^3$ |
| Conductivity | < 2200 µS/cm |
| Residue on evaporation | < 500 mg/dm$^3$ |
| Potassium permanganate consumption | < 25 mg/dm$^3$ |
| Suspended matter | < 3 mg/dm$^3$ |
| Particular size range filtration recommendations | > 3 < 15 mg/dm$^3$ part flow purification recommended<br>> 15 mg/dm$^3$ continuous purification recommended |

| Closed-loop water specifications | Raw water | Treated water system |
|---|---|---|
| pH | 6.5–9.5 | 8.0–10.0 |
| Specific conductance at 25°C | 10–1,000 µmhos | 10–4,500 µmhos |
| "M" Alkalinity ($CaCO_{3)}$ | 20–300 ppm | 100–1,000 ppm |
| Sulfur ($SO_{4)}$ | 0–150 ppm | 0–150 ppm |
| Chloride (Cl) | 0–150 ppm | 0–150 ppm |
| Hardness ($CaCO_{3)}$ | 0–350 ppm | 0–350 ppm |
| Calcium hardness ($CaCO_{3)}$ | 0–200 ppm | 0–200 ppm |
| Magnesium hardness ($CaCO_{3)}$ | 0–150 ppm | 0–150 ppm |
| Copper (Cu) | < 0.10 ppm | < 0.20 ppm |
| Iron (Fe) | < 3.0 ppm | < 3.0 ppm |
| Aluminum (Al) | 0.5 ppm maximum | 0.5 ppm maximum |
| Sodium (Na) | 0–1,000 ppm | 0–1,000 ppm |
| Silica ($SiO_2$) | 0–150 ppm | 0–150 ppm |
| Zinc (Zn) | 1.0 ppm maximum | 1.0 ppm maximum |
| Manganese (Mn) | 0.1 ppm maximum | 0.1 ppm maximum |
| Phosphate Ortho- ($PO_4$) | 3 ppm | 3 ppm |
| Nitrite ($NO_2$) | 700–1,200 ppm | 700–1,200 ppm |

| Closed-loop water specifications | Raw water | Treated water system |
|---|---|---|
| Molybdenum (Mo) | 50–300 ppm | 50–300 ppm |
| Tolytriazole | 15–20 ppm | 15–20 ppm |
| Suspended solid | < 1 µm | < 1 µm |

# Monitoring the quality of cooling solutions

Depending on the type of installation, it is advisable to put in place certain processes and procedures for monitoring the quality of the cooling solution and for performing preventative maintenance. The following table lists common types of contamination and techniques to eliminate them:

| Type of impurity | Procedure |
|---|---|
| Mechanical contamination | Filter the water using 1-micron filter (3.9e-5 in), sieving filter, sand filter, cartridge filter, or pre-coated filter. |
| Hardness too high | Soften the water through ion exchange. |
| Moderate content of mechanical impurities and hardness agents | Add stabilizers, dispersing agents, or both to the water.<br>Use Azole treatment for copper corrosion. |
| Moderate content of chemical impurities | Use Anodic inhibitors: Nitrite based treatment<br>Use Cathodic inhibitors: Molybdate based treatment<br>Inoculate the water with passivators, inhibitors, or both. |
| Biological impurities, microbacteria, and algae | Inoculate the water with biocides. |

To ensure ongoing safe reliable operation of the closed-loop cooling system, see "Acceptable water quality range (on page 64)."

# Frost damage

To avoid frost damage, the water temperature must not be allowed to fall below the minimum permissible temperature of +4 °C (+39.2 °F) at any point in the water cycle.

Before storage or transportation at sub-zero temperatures, the water cycle must be drained completely using compressed air. Avoid setting the target temperature lower than is necessary because the danger of falling below the dew point increases as water temperature decreases (condensation buildup). Ensure that the enclosure is sealed on all sides, and in particular at the cable inlet (condensation formation).

# Leveling requirements

Adjust the MCS leveling feet so that the unit is level.

For more information about seismic area considerations, refer to the *HP Modular Cooling System Site Preparation Guide* on the HP website (http://www.hp.com).

# Condensation management

Any condensation that forms is collected in each individual cooling module and is taken through a discharge tube to a condensation tray integrated in the base assembly. Where multiple cooling modules are used, the condensate discharge tubes are connected to one another using quick connectors. Any condensation that occurs is then removed through this series of connections to the condensation tray.

When the specified condensation level in the condensation tray is reached, a sensor activates a pump that pumps the condensation into the return system. A further discharge tube runs out of the system from condensation tray to drain excess fluid if needed. This hose should be connected to a collection system or an external drain.

To ensure reliable drainage:

- Ensure no kinks form in the drainage hose.
- Do not reduce diameter of drainage hose.
- Route the drainage hoses so that they always run downhill.

To avoid excessive buildup of condensate and to conserve energy, consider raising the cooling water temperature to the necessary cooling capacity.

# Technical support

In this section

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# Before you contact HP

Be sure to have the following information available before you call HP:

- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

# HP contact information

For the name of the nearest HP authorized reseller:

- In the United States, see the HP US service locator webpage (http://www.hp.com/service_locator).
- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

For HP technical support:

- In the United States, for contact options see the Contact HP United States webpage (http://welcome.hp.com/country/us/en/contact_us.html). To contact HP by phone:
  - Call 1-800-HP-INVENT (1-800-474-6836). This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.
  - If you have purchased a Care Pack (service upgrade), call 1-800-633-3600. For more information about Care Packs, refer to the HP website (http://www.hp.com).
- In other locations, see the Contact HP worldwide (in English) webpage (http://welcome.hp.com/country/us/en/wwcontact.html).

# Customer Self Repair

HP products are designed with many Customer Self Repair (CSR) parts to minimize repair time and allow for greater flexibility in performing defective parts replacement. If during the diagnosis period HP (or HP

service providers or service partners) identifies that the repair can be accomplished by the use of a CSR part, HP will ship that part directly to you for replacement. There are two categories of CSR parts:

- **Mandatory**—Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.
- **Optional**—Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.

**NOTE:** Some HP parts are not designed for customer self repair. In order to satisfy the customer warranty, HP requires that an authorized service provider replace the part. These parts are identified as "No" in the Illustrated Parts Catalog.

Based on availability and where geography permits, CSR parts will be shipped for next business day delivery. Same day or four-hour delivery may be offered at an additional charge where geography permits. If assistance is required, you can call the HP Technical Support Center and a technician will help you over the telephone. HP specifies in the materials shipped with a replacement CSR part whether a defective part must be returned to HP. In cases where it is required to return the defective part to HP, you must ship the defective part back to HP within a defined period of time, normally five (5) business days. The defective part must be returned with the associated documentation in the provided shipping material. Failure to return the defective part may result in HP billing you for the replacement. With a customer self repair, HP will pay all shipping and part return costs and determine the courier/carrier to be used.

For more information about HP's Customer Self Repair program, contact your local service provider. For the North American program, refer to the HP website (http://www.hp.com/go/selfrepair).

# Réparation par le client (CSR)

Les produits HP comportent de nombreuses pièces CSR (Customer Self Repair = réparation par le client) afin de minimiser les délais de réparation et faciliter le remplacement des pièces défectueuses. Si pendant la période de diagnostic, HP (ou ses partenaires ou mainteneurs agréés) détermine que la réparation peut être effectuée à l'aide d'une pièce CSR, HP vous l'envoie directement. Il existe deux catégories de pièces CSR:

- **Obligatoire** - Pièces pour lesquelles la réparation par le client est obligatoire. Si vous demandez à HP de remplacer ces pièces, les coûts de déplacement et main d'œuvre du service vous seront facturés.
- **Facultatif** - Pièces pour lesquelles la réparation par le client est facultative. Ces pièces sont également conçues pour permettre au client d'effectuer lui-même la réparation. Toutefois, si vous demandez à HP de remplacer ces pièces, l'intervention peut ou non vous être facturée, selon le type de garantie applicable à votre produit.

**REMARQUE:** Certaines pièces HP ne sont pas conçues pour permettre au client d'effectuer lui-même la réparation. Pour que la garantie puisse s'appliquer, HP exige que le remplacement de la pièce soit effectué par un Mainteneur Agréé. Ces pièces sont identifiées par la mention "Non" dans le Catalogue illustré.

Les pièces CSR sont livrées le jour ouvré suivant, dans la limite des stocks disponibles et selon votre situation géographique. Si votre situation géographique le permet et que vous demandez une livraison le jour même ou dans les 4 heures, celle-ci vous sera facturée. Pour bénéficier d'une assistance téléphonique, appelez le Centre d'assistance technique HP. Dans les documents envoyés avec la pièce de rechange CSR, HP précise s'il est nécessaire de lui retourner la pièce défectueuse. Si c'est le cas, vous devez le faire dans le délai indiqué, généralement cinq (5) jours ouvrés. La pièce et sa documentation

doivent être retournées dans l'emballage fourni. Si vous ne retournez pas la pièce défectueuse, HP se réserve le droit de vous facturer les coûts de remplacement. Dans le cas d'une pièce CSR, HP supporte l'ensemble des frais d'expédition et de retour, et détermine la société de courses ou le transporteur à utiliser.

Pour plus d'informations sur le programme CSR de HP, contactez votre Mainteneur Agrée local. Pour plus d'informations sur ce programme en Amérique du Nord, consultez le site Web HP (http://www.hp.com/go/selfrepair).

# Riparazione da parte del cliente

Per abbreviare i tempi di riparazione e garantire una maggiore flessibilità nella sostituzione di parti difettose, i prodotti HP sono realizzati con numerosi componenti che possono essere riparati direttamente dal cliente (CSR, Customer Self Repair). Se in fase di diagnostica HP (o un centro di servizi o di assistenza HP) identifica il guasto come riparabile mediante un ricambio CSR, HP lo spedirà direttamente al cliente per la sostituzione. Vi sono due categorie di parti CSR:

- **Obbligatorie** – Parti che devono essere necessariamente riparate dal cliente. Se il cliente ne affida la riparazione ad HP, deve sostenere le spese di spedizione e di manodopera per il servizio.
- **Opzionali** – Parti la cui riparazione da parte del cliente è facoltativa. Si tratta comunque di componenti progettati per questo scopo. Se tuttavia il cliente ne richiede la sostituzione ad HP, potrebbe dover sostenere spese addizionali a seconda del tipo di garanzia previsto per il prodotto.

**NOTA:** alcuni componenti HP non sono progettati per la riparazione da parte del cliente. Per rispettare la garanzia, HP richiede che queste parti siano sostituite da un centro di assistenza autorizzato. Tali parti sono identificate da un "No" nel Catalogo illustrato dei componenti.

In base alla disponibilità e alla località geografica, le parti CSR vengono spedite con consegna entro il giorno lavorativo seguente. La consegna nel giorno stesso o entro quattro ore è offerta con un supplemento di costo solo in alcune zone. In caso di necessità si può richiedere l'assistenza telefonica di un addetto del centro di supporto tecnico HP. Nel materiale fornito con una parte di ricambio CSR, HP specifica se il cliente deve restituire dei componenti. Qualora sia richiesta la resa ad HP del componente difettoso, lo si deve spedire ad HP entro un determinato periodo di tempo, generalmente cinque (5) giorni lavorativi. Il componente difettoso deve essere restituito con la documentazione associata nell'imballo di spedizione fornito. La mancata restituzione del componente può comportare la fatturazione del ricambio da parte di HP. Nel caso di riparazione da parte del cliente, HP sostiene tutte le spese di spedizione e resa e sceglie il corriere/vettore da utilizzare.

Per ulteriori informazioni sul programma CSR di HP contattare il centro di assistenza di zona. Per il programma in Nord America fare riferimento al sito Web **HP** (http://www.hp.com/go/selfrepair).

# Customer Self Repair

HP Produkte enthalten viele CSR-Teile (Customer Self Repair), um Reparaturzeiten zu minimieren und höhere Flexibilität beim Austausch defekter Bauteile zu ermöglichen. Wenn HP (oder ein HP Servicepartner) bei der Diagnose feststellt, dass das Produkt mithilfe eines CSR-Teils repariert werden kann, sendet Ihnen HP dieses Bauteil zum Austausch direkt zu. CSR-Teile werden in zwei Kategorien unterteilt:

- **Zwingend –** Teile, für die das Customer Self Repair-Verfahren zwingend vorgegeben ist. Wenn Sie den Austausch dieser Teile von HP vornehmen lassen, werden Ihnen die Anfahrt- und Arbeitskosten für diesen Service berechnet.

- **Optional –** Teile, für die das Customer Self Repair-Verfahren optional ist. Diese Teile sind auch für Customer Self Repair ausgelegt. Wenn Sie jedoch den Austausch dieser Teile von HP vornehmen lassen möchten, können bei diesem Service je nach den für Ihr Produkt vorgesehenen Garantiebedingungen zusätzliche Kosten anfallen.

**HINWEIS**: Einige Teile sind nicht für Customer Self Repair ausgelegt. Um den Garantieanspruch des Kunden zu erfüllen, muss das Teil von einem HP Servicepartner ersetzt werden. Im illustrierten Teilekatalog sind diese Teile mit „No" bzw. „Nein" gekennzeichnet.

CSR-Teile werden abhängig von der Verfügbarkeit und vom Lieferziel am folgenden Geschäftstag geliefert. Für bestimmte Standorte ist eine Lieferung am selben Tag oder innerhalb von vier Stunden gegen einen Aufpreis verfügbar. Wenn Sie Hilfe benötigen, können Sie das HP technische Support Center anrufen und sich von einem Mitarbeiter per Telefon helfen lassen. Den Materialien, die mit einem CSR-Ersatzteil geliefert werden, können Sie entnehmen, ob das defekte Teil an HP zurückgeschickt werden muss. Wenn es erforderlich ist, das defekte Teil an HP zurückzuschicken, müssen Sie dies innerhalb eines vorgegebenen Zeitraums tun, in der Regel innerhalb von fünf (5) Geschäftstagen. Das defekte Teil muss mit der zugehörigen Dokumentation in der Verpackung zurückgeschickt werden, die im Lieferumfang enthalten ist. Wenn Sie das defekte Teil nicht zurückschicken, kann HP Ihnen das Ersatzteil in Rechnung stellen. Im Falle von Customer Self Repair kommt HP für alle Kosten für die Lieferung und Rücksendung auf und bestimmt den Kurier-/Frachtdienst.

Weitere Informationen über das HP Customer Self Repair Programm erhalten Sie von Ihrem Servicepartner vor Ort. Informationen über das CSR-Programm in Nordamerika finden Sie auf der HP Website unter (http://www.hp.com/go/selfrepair).

# Reparaciones del propio cliente

Los productos de HP incluyen muchos componentes que el propio usuario puede reemplazar (*Customer Self Repair*, CSR) para minimizar el tiempo de reparación y ofrecer una mayor flexibilidad a la hora de realizar sustituciones de componentes defectuosos. Si, durante la fase de diagnóstico, HP (o los proveedores o socios de servicio de HP) identifica que una reparación puede llevarse a cabo mediante el uso de un componente CSR, HP le enviará dicho componente directamente para que realice su sustitución. Los componentes CSR se clasifican en dos categorías:

- **Obligatorio:** componentes para los que la reparación por parte del usuario es obligatoria. Si solicita a HP que realice la sustitución de estos componentes, tendrá que hacerse cargo de los gastos de desplazamiento y de mano de obra de dicho servicio.
- **Opcional:** componentes para los que la reparación por parte del usuario es opcional. Estos componentes también están diseñados para que puedan ser reparados por el usuario. Sin embargo, si precisa que HP realice su sustitución, puede o no conllevar costes adicionales, dependiendo del tipo de servicio de garantía correspondiente al producto.

**NOTA:** Algunos componentes no están diseñados para que puedan ser reparados por el usuario. Para que el usuario haga valer su garantía, HP pone como condición que un proveedor de servicios autorizado realice la sustitución de estos componentes. Dichos componentes se identifican con la palabra "No" en el catálogo ilustrado de componentes.

Según la disponibilidad y la situación geográfica, los componentes CSR se enviarán para que lleguen a su destino al siguiente día laborable. Si la situación geográfica lo permite, se puede solicitar la entrega en el mismo día o en cuatro horas con un coste adicional. Si precisa asistencia técnica, puede llamar al Centro de asistencia técnica de HP y recibirá ayuda telefónica por parte de un técnico. Con el envío de materiales para la sustitución de componentes CSR, HP especificará si los componentes defectuosos deberán devolverse a HP. En aquellos casos en los que sea necesario devolver algún componente a HP,

deberá hacerlo en el periodo de tiempo especificado, normalmente cinco días laborables. Los componentes defectuosos deberán devolverse con toda la documentación relacionada y con el embalaje de envío. Si no enviara el componente defectuoso requerido, HP podrá cobrarle por el de sustitución. En el caso de todas sustituciones que lleve a cabo el cliente, HP se hará cargo de todos los gastos de envío y devolución de componentes y escogerá la empresa de transporte que se utilice para dicho servicio.

Para obtener más información acerca del programa de Reparaciones del propio cliente de HP, póngase en contacto con su proveedor de servicios local. Si está interesado en el programa para Norteamérica, visite la página web de HP siguiente (http://www.hp.com/go/selfrepair).

# Customer Self Repair

Veel onderdelen in HP producten zijn door de klant zelf te repareren, waardoor de reparatieduur tot een minimum beperkt kan blijven en de flexibiliteit in het vervangen van defecte onderdelen groter is. Deze onderdelen worden CSR-onderdelen (Customer Self Repair) genoemd. Als HP (of een HP Service Partner) bij de diagnose vaststelt dat de reparatie kan worden uitgevoerd met een CSR-onderdeel, verzendt HP dat onderdeel rechtstreeks naar u, zodat u het defecte onderdeel daarmee kunt vervangen. Er zijn twee categorieën CSR-onderdelen:

- **Verplicht:** Onderdelen waarvoor reparatie door de klant verplicht is. Als u HP verzoekt deze onderdelen voor u te vervangen, worden u voor deze service reiskosten en arbeidsloon in rekening gebracht.
- **Optioneel:** Onderdelen waarvoor reparatie door de klant optioneel is. Ook deze onderdelen zijn ontworpen voor reparatie door de klant. Als u echter HP verzoekt deze onderdelen voor u te vervangen, kunnen daarvoor extra kosten in rekening worden gebracht, afhankelijk van het type garantieservice voor het product.

**OPMERKING:** Sommige HP onderdelen zijn niet ontwikkeld voor reparatie door de klant. In verband met de garantievoorwaarden moet het onderdeel door een geautoriseerde Service Partner worden vervangen. Deze onderdelen worden in de geïllustreerde onderdelencatalogus aangemerkt met "Nee".

Afhankelijk van de leverbaarheid en de locatie worden CSR-onderdelen verzonden voor levering op de eerstvolgende werkdag. Levering op dezelfde dag of binnen vier uur kan tegen meerkosten worden aangeboden, indien dit mogelijk is gezien de locatie. Indien assistentie gewenst is, belt u een HP Service Partner om via de telefoon technische ondersteuning te ontvangen. HP vermeldt in de documentatie bij het vervangende CSR-onderdeel of het defecte onderdeel aan HP moet worden geretourneerd. Als het defecte onderdeel aan HP moet worden teruggezonden, moet u het defecte onderdeel binnen een bepaalde periode, gewoonlijk vijf (5) werkdagen, retourneren aan HP. Het defecte onderdeel moet met de bijbehorende documentatie worden geretourneerd in het meegeleverde verpakkingsmateriaal. Als u het defecte onderdeel niet terugzendt, kan HP u voor het vervangende onderdeel kosten in rekening brengen. Bij reparatie door de klant betaalt HP alle verzendkosten voor het vervangende en geretourneerde onderdeel en kiest HP zelf welke koerier/transportonderneming hiervoor wordt gebruikt.

Neem contact op met een Service Partner voor meer informatie over het Customer Self Repair programma van HP. Informatie over Service Partners vindt u op de **HP website** (http://www.hp.nl/services/servicepartners).

# Reparo feito pelo cliente

Os produtos da HP são projetados com muitas peças para reparo feito pelo cliente (CSR) de modo a minimizar o tempo de reparo e permitir maior flexibilidade na substituição de peças com defeito. Se, durante o período de diagnóstico, a HP (ou fornecedores/parceiros de serviço da HP) concluir que o

reparo pode ser efetuado pelo uso de uma peça CSR, a peça de reposição será enviada diretamente ao cliente. Existem duas categorias de peças CSR:

- **Obrigatória** – Peças cujo reparo feito pelo cliente é obrigatório. Se desejar que a HP substitua essas peças, serão cobradas as despesas de transporte e mão-de-obra do serviço.
- **Opcional** – Peças cujo reparo feito pelo cliente é opcional. Essas peças também são projetadas para o reparo feito pelo cliente. No entanto, se desejar que a HP as substitua, pode haver ou não a cobrança de taxa adicional, dependendo do tipo de serviço de garantia destinado ao produto.

**OBSERVAÇÃO:** Algumas peças da HP não são projetadas para o reparo feito pelo cliente. A fim de cumprir a garantia do cliente, a HP exige que um técnico autorizado substitua a peça. Essas peças estão identificadas com a marca "No" (Não), no catálogo de peças ilustrado.

Conforme a disponibilidade e o local geográfico, as peças CSR serão enviadas no primeiro dia útil após o pedido. Onde as condições geográficas permitirem, a entrega no mesmo dia ou em quatro horas pode ser feita mediante uma taxa adicional. Se precisar de auxílio, entre em contato com o Centro de suporte técnico da HP para que um técnico o ajude por telefone. A HP especifica nos materiais fornecidos com a peça CSR de reposição se a peça com defeito deve ser devolvida à HP. Nos casos em que isso for necessário, é preciso enviar a peça com defeito à HP dentro do período determinado, normalmente cinco (5) dias úteis. A peça com defeito deve ser enviada com a documentação correspondente no material de transporte fornecido. Caso não o faça, a HP poderá cobrar a reposição. Para as peças de reparo feito pelo cliente, a HP paga todas as despesas de transporte e de devolução da peça e determina a transportadora/serviço postal a ser utilizado.

Para obter mais informações sobre o programa de reparo feito pelo cliente da HP, entre em contato com o fornecedor de serviços local. Para o programa norte-americano, visite o site da HP (http://www.hp.com/go/selfrepair).

# 顧客自己修理保証サービス

修理時間を短縮し、故障部品の交換における高い柔軟性を確保するために、HP製品には多数の顧客自己修理（CSR）部品があります。診断の際に、CSR部品を使用すれば修理ができるとHP（HPまたはHP正規保守代理店）が判断した場合、HPはその部品を直接、お客様に発送し、お客様に交換していただきます。CSR部品には以下の2通りがあります。

- 必須 - 顧客自己修理が必須の部品。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、その修理サービスに関する交通費および人件費がお客様に請求されます。
- 任意 - 顧客自己修理が任意である部品。この部品も顧客自己修理用です。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、お買い上げの製品に適用される保証サービス内容の範囲内においては、別途費用を負担していただくことなく保証サービスを受けることができます。

注： HP製品の一部の部品は、顧客自己修理用ではありません。製品の保証を継続するためには、HPまたはHP正規保守代理店による交換作業が必須となります。部品カタログには、当該部品が顧客自己修理除外品である旨が記載されています。

部品供給が可能な場合、地域によっては、CSR部品を翌営業日に届くように発送します。また、地域によっては、追加費用を負担いただくことにより同日または4時間以内に届くように発送することも可能な場合があります。サポートが必要なときは、HPの修理受付窓口に電話していただければ、技術者が電話でアドバイスします。交換用のCSR部品または同梱物には、故障部品をHPに返送する必要があるかどうかが表示されています。故障部品をHPに返送する必要がある場合は、指定期限内（通常は5営業日以内）に故障部品をHPに返送してください。故障部品を返送する場合は、届いた時の梱包箱に関連書類とともに入れてください。故障部品を返送しない場合、HPから部品費用が請求されます。顧客自己修理の際には、HPは送料および部品返送費を全額負担し、使用する宅配便会社や運送会社を指定します。

# 客户自行维修

HP 产品提供许多客户自行维修 (CSR) 部件，以尽可能缩短维修时间和在更换缺陷部件方面提供更大的灵活性。如果在诊断期间 HP（或 HP 服务提供商或服务合作伙伴）确定可以通过使用 CSR 部件完成维修，HP 将直接把该部件发送给您进行更换。有两类 CSR 部件：

- **强制性的** — 要求客户必须自行维修的部件。如果您请求 HP 更换这些部件，则必须为该服务支付差旅费和人工费用。
- **可选的** — 客户可以选择是否自行维修的部件。这些部件也是为客户自行维修设计的。不过，如果您要求 HP 为您更换这些部件，则根据为您的产品指定的保修服务类型，HP 可能收取或不再收取任何附加费用。

**注：**某些 HP 部件的设计并未考虑客户自行维修。为了满足客户保修的需要，HP 要求授权服务提供商更换相关部件。这些部件在部件图解目录中标记为“否”。

CSR 部件将在下一个工作日发运（取决于备货情况和允许的地理范围）。在允许的地理范围内，可在当天或四小时内发运，但要收取额外费用。如果需要帮助，您可以致电 HP 技术支持中心，将会有技术人员通过电话为您提供帮助。HP 会在随更换的 CSR 部件发运的材料中指明是否必须将有缺陷的部件返还给 HP。如果要求您将有缺陷的部件返还给 HP，那么您必须在规定期限内（通常是五 (5) 个工作日）将缺陷部件发给 HP。有缺陷的部件必须随所提供的发运材料中的相关文件一起返还。如果未能送还有缺陷的部件，HP 可能会要求您支付更换费用。客户自行维修时，HP 将承担所有相关运输和部件返回费用，并指定快递商/承运商。

有关 HP 客户自行维修计划的详细信息，请与您当地的服务提供商联系。有关北美地区的计划，请访问 HP 网站 (http://www.hp.com/go/selfrepair)。

# 客戶自行維修

HP 產品設計了許多「客戶自行維修」(CSR) 的零件以減少維修時間，並且使得更換瑕疵零件時能有更大的彈性。如果在診斷期間 HP（或 HP 服務供應商或維修夥伴）辨認出此項維修工作可以藉由使用 CSR 零件來完成，則 HP 將直接寄送該零件給您作更換。CSR 零件分為兩種類別：

- **強制的** — 客戶自行維修所使用的零件是強制性的。如果您要求 HP 更換這些零件，HP 將會向您收取此服務所需的外出費用與勞動成本。
- **選購的** — 客戶自行維修所使用的零件是選購的。這些零件也設計用於客戶自行維修之用。不過，如果您要求 HP 為您更換，則可能需要也可能不需要負擔額外的費用，端視針對此產品指定的保固服務類型而定。

**備註：**某些 HP 零件沒有消費者可自行維修的設計。為符合客戶保固，HP 需要授權的服務供應商更換零件。這些零件在圖示的零件目錄中，被標示為「否」。

基於材料取得及環境允許的情況下，CSR 零件將於下一個工作日以快遞寄送。在環境的允許下當天或四小時內送達，則可能需要額外的費用。若您需要協助，可致電「HP 技術支援中心」，會有一位技術人員透過電話來協助您。不論損壞的零件是否必須退回，HP 皆會在與 CSR 替換零件一起運送的材料中註明。若要將損壞的零件退回 HP，您必須在指定的一段時間內（通常為五 (5) 個工作天），將損壞的零件寄回 HP。損壞的零件必須與寄送資料中隨附的相關技術文件一併退還。如果無法退還損壞的零件，HP 可能要向您收取替換費用。針對客戶自行維修情形，HP 將負責所有運費及零件退還費用並指定使用何家快遞/貨運公司。

如需 HP 的「客戶自行維修」方案詳細資訊，請連絡您當地的服務供應商。至於北美方案，請參閱 HP 網站 (http://www.hp.com/go/selfrepair)。

# 고객 셀프 수리

HP 제품은 수리 시간을 최소화하고 결함이 있는 부품 교체 시 더욱 융통성을 발휘할 수 있도록 하기 위해 고객 셀프 수리(CSR) 부품을 다량 사용하여 설계되었습니다. 진단 기간 동안 HP(또는 HP 서비스 공급업체 또는 서비스 협력업체)에서 CSR 부품을 사용하여 수리가 가능하다고 판단되면 HP는 해당 부품을 바로 사용자에게 보내어 사용자가 교체할 수 있도록 합니다. CSR 부품에는 두 가지 종류가 있습니다.

- **고객 셀프 수리가 의무 사항인 필수 부품.** 사용자가 HP에 이 부품의 교체를 요청할 경우 이 서비스에 대한 출장비 및 작업비가 청구됩니다.
- **고객 셀프 수리가 선택 사항인 부품.** 이 부품들도 고객 셀프 수리가 가능하도록 설계되었습니다. 하지만 사용자가 HP에 이 부품의 교체를 요청할 경우 사용자가 구입한 제품에 해당하는 보증 서비스 유형에 따라 추가 비용 없이 교체가 가능할 수 있습니다.

**참고:** 일부 HP 부품은 고객 셀프 수리가 불가능하도록 설계되었습니다. HP는 만족스러운 고객 보증을 위해 공인 서비스 제공업체를 통해 부품을 교체하도록 하고 있습니다. 이러한 부품들은 Illustrated Parts Catalog에 "No"라고 표시되어 있습니다.

CSR 부품은 재고 상태와 지리적 조건이 허용하는 경우 다음 영업일 납품이 가능하도록 배송이 이루어집니다. 지리적 조건이 허용하는 경우 추가 비용이 청구되는 조건으로 당일 또는 4시간 배송이 가능할 수도 있습니다. 도움이 필요하시면 HP 기술 지원 센터로 전화하십시오. 전문 기술자가 전화로 도움을 줄 것입니다. HP는 결함이 발생한 부품을 HP로 반환해야 하는지 여부를 CSR 교체 부품과 함께 배송된 자료에 지정합니다. 결함이 발생한 부품을 HP로 반환해야 하는 경우에는 지정된 기간 내(통상 영업일 기준 5일)에 HP로 반환해야 합니다. 이 때 결함이 발생한 부품은 제공된 포장 재료에 넣어 관련 설명서와 함께 반환해야 합니다. 결함이 발생한 부품을 반환하지 않는 경우 HP가 교체 부품에 대해 비용을 청구할 수 있습니다. 고객 셀프 수리의 경우, HP는 모든 운송 및 부품 반환 비용을 부담하며 이용할 운송업체 및 택배 서비스를 결정합니다.

HP 고객 셀프 수리 프로그램에 대한 자세한 내용은 가까운 서비스 제공업체에 문의하십시오. 북미 지역의 프로그램에 대해서는 HP 웹 사이트(http://www.hp.com/go/selfrepair)를 참조하십시오.

# Regulatory compliance notices

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## Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

## Federal Communications Commission notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

## Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

# Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

# Canadian notice

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

# European Union regulatory notice

This product complies with the following EU Directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 89/336/EEC
- Machinery Directive 98/37/EEC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

CE

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).

CE(xxxx*)!

This marking is valid for EU non-harmonized Telecom products.

*Notified body number (used only if applicable—refer to the product label)

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

# Disposal of waste equipment by users in private households in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

# Japanese class A notice

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

# BSMI notice

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

# Korean class A notice

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

# Laser compliance

This product may be provided with an optical storage device (that is, CD or DVD drive) and/or fiber optic transceiver. Each of these devices contains a laser that is classified as a Class 1 Laser Product in

accordance with US FDA regulations and the IEC 60825-1. The product does not emit hazardous laser radiation.

Each laser product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated May 27, 2001; and with IEC 60825-1:1993/A2:2001.

⚠ **WARNING:** Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the module enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP Authorized Service technicians to repair the unit.

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

# Battery replacement notice

⚠ **WARNING:** The computer contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery pack. A risk of fire and burns exists if the battery pack is not properly handled. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose the battery to temperatures higher than 60°C (140°F).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, use the public collection system or return them to HP, an authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an authorized reseller or an authorized service provider.

# Taiwan battery recycling notice

The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

# Power cord statement for Japan

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

# Acronyms and abbreviations

### CSB

chemical species balance

### CSR

Customer Self Repair

### DHCP

Dynamic Host Configuration Protocol

### DST

daylight savings time

### EEPROM

electrical erasable programmable read only memory

### FTP

file transfer protocol

### GMT

Greenwich mean time

### HTTP

hypertext transfer protocol

### HTTPS

hypertext transfer protocol secure sockets

### IP

Internet Protocol

### MCS

modular cooling system

### NTP

network time protocol

## PDU

power distribution unit

## SIM

Systems Insight Manager

## SMTP

Simple Mail Transfer Protocol

## SNMP

Simple Network Management Protocol

## SSH

Secure Shell

## SSL

Secure Sockets Layer

## TCP

Transmission Control Protocol

## TFTP

Trivial File Transfer Protocol

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